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ELECTRIC RAILWAY JOURNAL

aw-Hill Publishing Company, Inc. MARCH 2, 1929 Twenty Cents P

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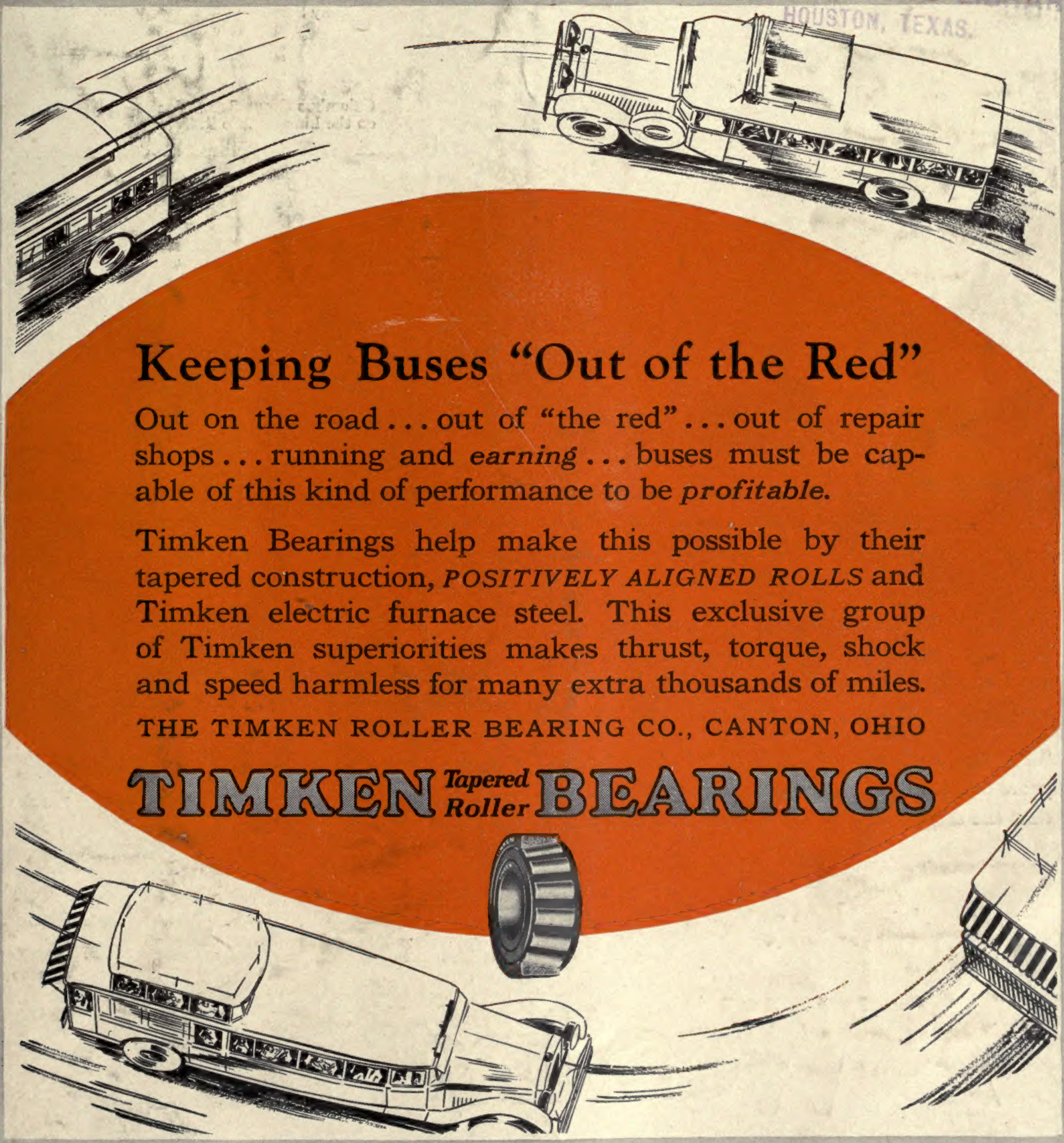


Keeping Buses "Out of the Red"

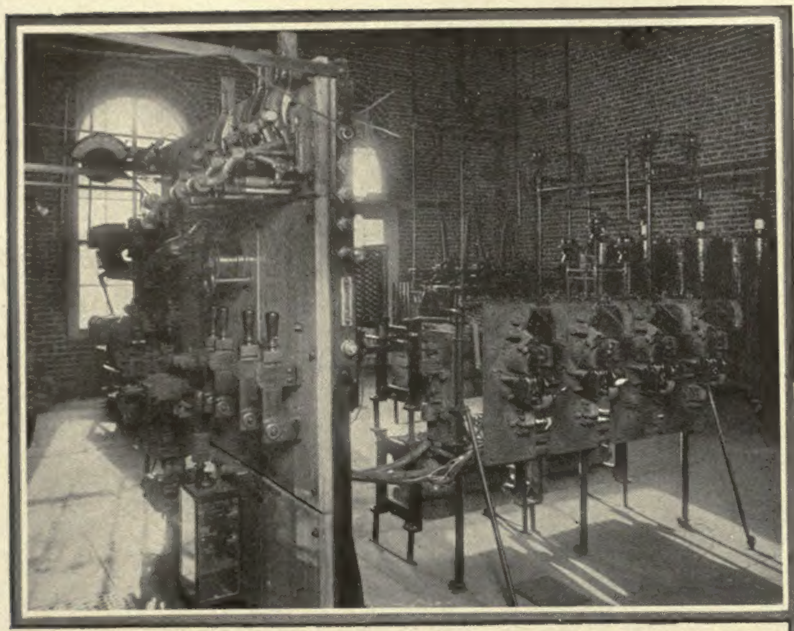
Out on the road . . . out of "the red" . . . out of repair shops . . . running and *earning* . . . buses must be capable of this kind of performance to be *profitable.*

Timken Bearings help make this possible by their tapered construction, *POSITIVELY ALIGNED ROLLS* and Timken electric furnace steel. This exclusive group of Timken superiorities makes thrust, torque, shock and speed harmless for many extra thousands of miles.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN *Tapered Roller* BEARINGS

12 Years of Successful Performance



First Westinghouse Automatic Switching Equipment for Railway Service

Columbus Grove Substation on the Lima-Toledo Railway

TWELVE years ago the first Westinghouse automatic switching equipment for railway service was installed in the Columbus Grove substation of the Lima-Toledo Railroad.

The following is an extract from a letter from Mr. J. J. Corderman, Master Mechanic for this railroad, in response to a recent inquiry regarding the performance of this equipment:

"The automatic feature was installed about twelve years ago and there have been but very few times that the station has failed to operate in that time. "The maintenance on the station is not so great as that of manually-operated stations. Our inspection periods for the automatic are just one-half of those for the manually-operated stations. In fact, the station has operated now for more than twelve months without a failure, and during that time we have used no material of any kind for repairs, not even brushes or contacts; in fact, nothing. We are very well pleased with the operation."

Circular 1793 fully describes Westinghouse Automatic Railway Substations. Ask our nearest office for your copy.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in all Principal Cities of the United States and Foreign Countries
T 30377

1929

Automatize with **Westinghouse**

Electric Railway Journal

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THE ASSOCIATED BUSINESS PAPERS AWARD
FOR OUTSTANDING EDITORIAL SERVICE
AWARDED 1927 TO
ELECTRIC RAILWAY JOURNAL

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1929

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Vol. 73, No. 9 *Pages 347–382*

March 2, 1929

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Austro-Swiss Electrification Progressing Rapidly 350

The progress that has been made on the extensive program started in 1919 is outlined in this article and the proposed electrification of the 193-mile line between Salzburg and Vienna discussed at length.

C., H. & D. Railway Modernizes Power Supply 357

BY H. A. ROSE

Automatic substations, described in this article, replace the obsolete manually-operated stations formerly used, and power is purchased now instead of generated in the railway's old power plant.

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The new Boston terminal contains a loop track and sufficient storage tracks to accommodate 60 cars, with ample room for expansion, a by-pass track, a yardmen's building and a complete signal system.

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BETTER RAIL, BETTER TRANSPORTATION

Mr. Rossell speaking:

"In the track department, in recent years, there have been brought out many new and valuable tools . . .
The greater and greater use of all forms of track tools and machinery offer very great possibilities for improved maintenance and lowered costs."

W. T. Rossell

General Manager, Pittsburgh Railways

In a paper presented at the Annual Convention A.E.R.E.A., 1928.

Now observe the illustrations and make sure you aren't missing anything.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS:

Chester F. Gailor, 50 Church St., New York City
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
H. F. McDermott, 208 S. LaSalle St., Chicago
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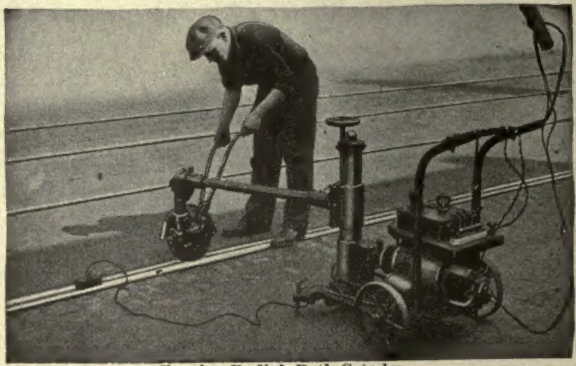
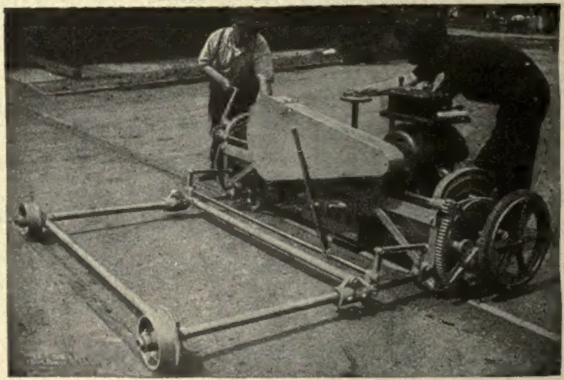
Equipment & Engineering Co., London
Frazar & Co., Japan

3187

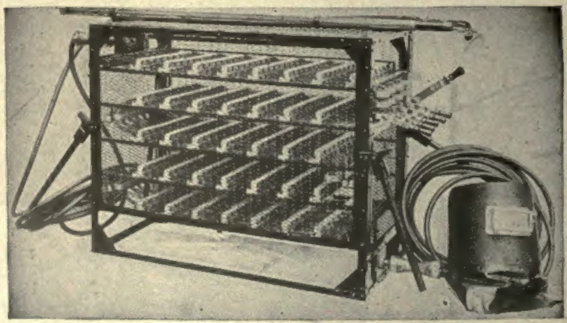
R. T. W. Track Oiler



Eureka Radial Rail Grinder



Vulcan Rail Grinder



"Ajax" Electric Arc Welder

BETTER RAIL, BETTER TRANSPORTATION

Columbia Gorge Motor Coach System, Portland, Ore., is 100% Goodyear-Equipped

2,400,000 Mountain Miles a Year— on Goodyears!

Boise—Yakima—Portland—Pendleton Spokane—Salt Lake—Lewiston—those names on the side of this coach tell a vivid story of the roads its Goodyear Tires must travel, to anyone who knows the West.

Steep climbs, and miles of grueling down-grade; dizzy curves flanked by sheer drops of a thousand feet or more; all kinds of roads, all kinds of weather, and arrival schedules which must be maintained.

Here certainly is driving worthy of the famous All-Weather traction which grips and holds on any road, delivering passengers in safety.

Here also is braking and driving strain, which tests the extra resilience, the extra vitality of SUPERTWIST Cord, used *only* in Goodyear Tires.

In the light of these facts, the statement of W. T. Crawford is especially significant. "We adopted Goodyear Tires 100% on our operation of thirty-seven buses a year ago, and since have had no cause for complaint either from a service or mileage standpoint. Traction and uninterrupted service are essential, and the service is very exacting, due to weather and road conditions."

Whether your requirements are for performance under such unusual driving conditions—or for the lowest per mile cost on smooth and level straightaways, you will find among the complete line of Goodyear Truck Tires the ones which accurately fit your hauling needs.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service, and there are also Goodyear Rubber Tire Chains

GOODYEAR

Copyright 1929, by The Goodyear Tire & Rubber Co., Inc.

One of the cars to which Simplex Clasp Brakes have been applied

SIMPLEX MULTIPLE UNIT CLASP BRAKES

Railroads would not purchase passenger cars without "Simplex Clasp Brakes."

Why not specify "Simplex Multiple Unit Motor and Trailer Truck Clasp Brakes" for Gas — Electric and Electric Cars.

Send us your inquiries for information and designs.

The mechanically correct Brake for a Modern Car.

ASF

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

He's Very Tractable and Efficient When You Give Him a Machine!

A "Man-Hour" represents cash, and is equivalent to 5.2 average fares.

A "MAN-HOUR" is not incorrigible. He can be reformed! While he has a bad habit of wasting too many fares (he equals 5.2 of them on the average), when using picks and shovels, mauls and crow-bars, he reforms instantly when you give him a machine and dignify him with a semi-skilled occupation.

The gist of the whole matter is that human labor is the most expensive source of power, but is quite efficient when guiding it. A "Man-Hour" can run a track building machine which takes the place of three or four of his partners—and turns out better work because motors don't have muscles to tire or brains to fag.

And the machine is quickly paid for in track construction by the "Man-Hours" it displaces and the improvement in the uniformity and quality of construction.

Use more machinery in track construction.

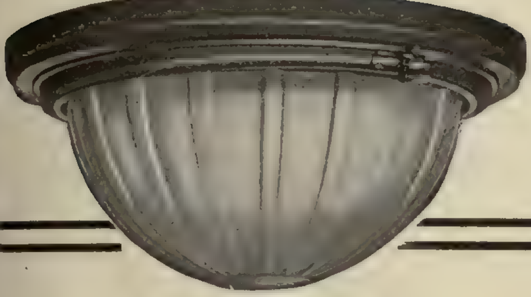
THE INTERNATIONAL STEEL TIE CO.
CLEVELAND, OHIO

STEEL TWIN TIE TRACK
THE BASE OF MODERNIZATION

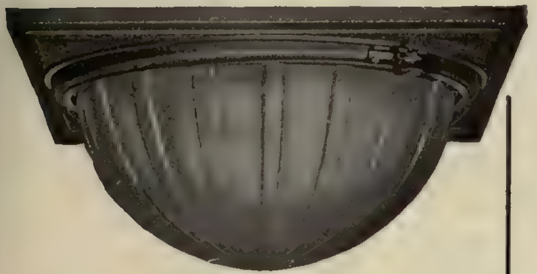
Do modern cars have good lighting? . . . Yes! Comfortable seats? . . . Yes! Do they provide safer and quicker transportation? . . . Yes, if equipped with the Westinghouse Variable Load Brake . . . the modern brake for modern cars.

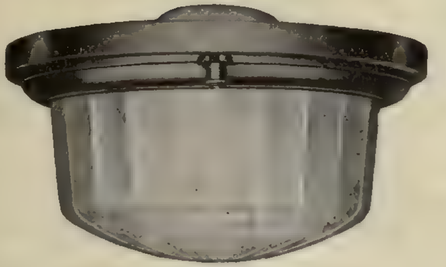
MODERN CARS
NEED
MODERN BRAKES

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works . . . WILMERDING, PA.

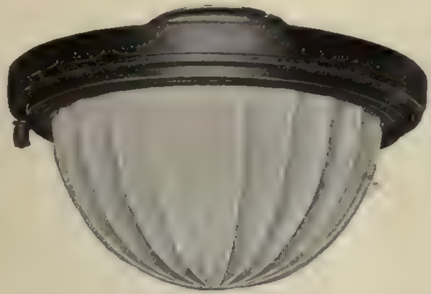


No. 27377





No. 27288 Fixture With No. 27440 Dome



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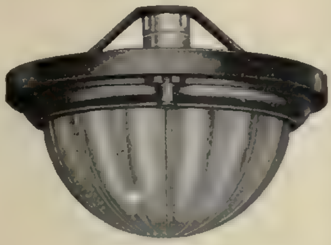


No. 27084

Light is an asset—make the most of it with Safety Dome type lighting fixtures

APPEARANCE, safety, comfort and convenience are adequately taken care of with Safety Dome type lighting fixtures.

The bowls are made of light density opal glass with statuary bronze finish on the fixtures. Special finishes can be supplied to order.

Safety Dome lighting fixtures are economical in current consumption, provide perfect diffusion of light, and practically eliminate lamp pilfering.

Made of pressed steel and pressed glass, sufficiently thick to stand up under the extreme vibration of transportation conditions. They permit the use of larger lamps which cuts the cost of lamp renewals, gives longer lamp life and simplifies wiring.

You have three standard sizes to select from accommodating 12, 10 and 8-in. glassware. Get the details on Safety Dome type fixtures today.

Home office and plant at 17th & Cambria Sts., PHILADELPHIA; District offices at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents, Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

ELECTRIC SERVICE SUPPLIES CO.

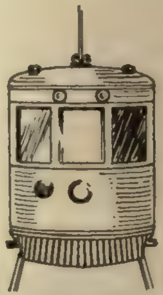
MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

With VARIOUS types of paving on the T. H. I. & E.

Used with brick paving, at Terre Haute, Ind.

Used with concrete paving, at Richmond, Ind.

Showing frog installation, at Terre Haute, Ind.



SINCE early in 1925, the THI&E Traction Company has used thousands of lineal feet of Carey Elastite System of Track Insulation on their lines through Indiana. For new construction, for repair work. With concrete, brick and asphalt paving—with T-rails. To minimize noise, to protect paving, to give patrons better service.

And what is true in the Hoosier State is true everywhere. Traction engineers in almost two hundred cities, large and small, are using and recommending this advanced system of track insulation. A really remarkable traction improvement! Of course, you will want all the facts.

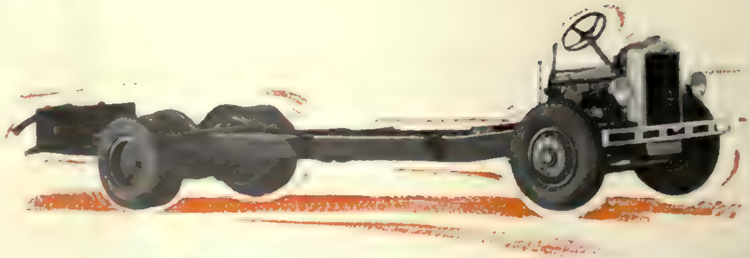
CAREY Elastite System of Track Insulation is a preformed asphaltic compound, reenforced with asphalt-saturated fibres. A moisture-proof, resilient rail-pavement cushion. Made to fit any rail section; easily installed, regardless of weather conditions.

Carey Elastite SYSTEM OF TRACK INSULATION

THE PHILIP CAREY COMPANY—*Lockland*, CINCINNATI, OHIO

The New
39
passenger
single deck
Yellow
Coach
– the Z 240

...conventional

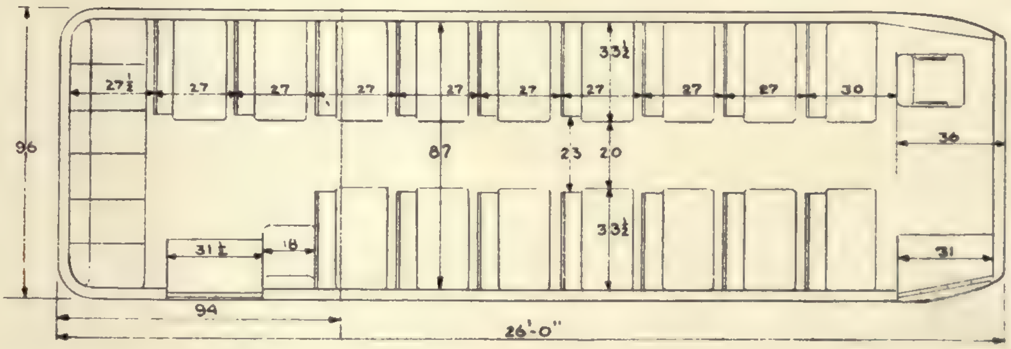


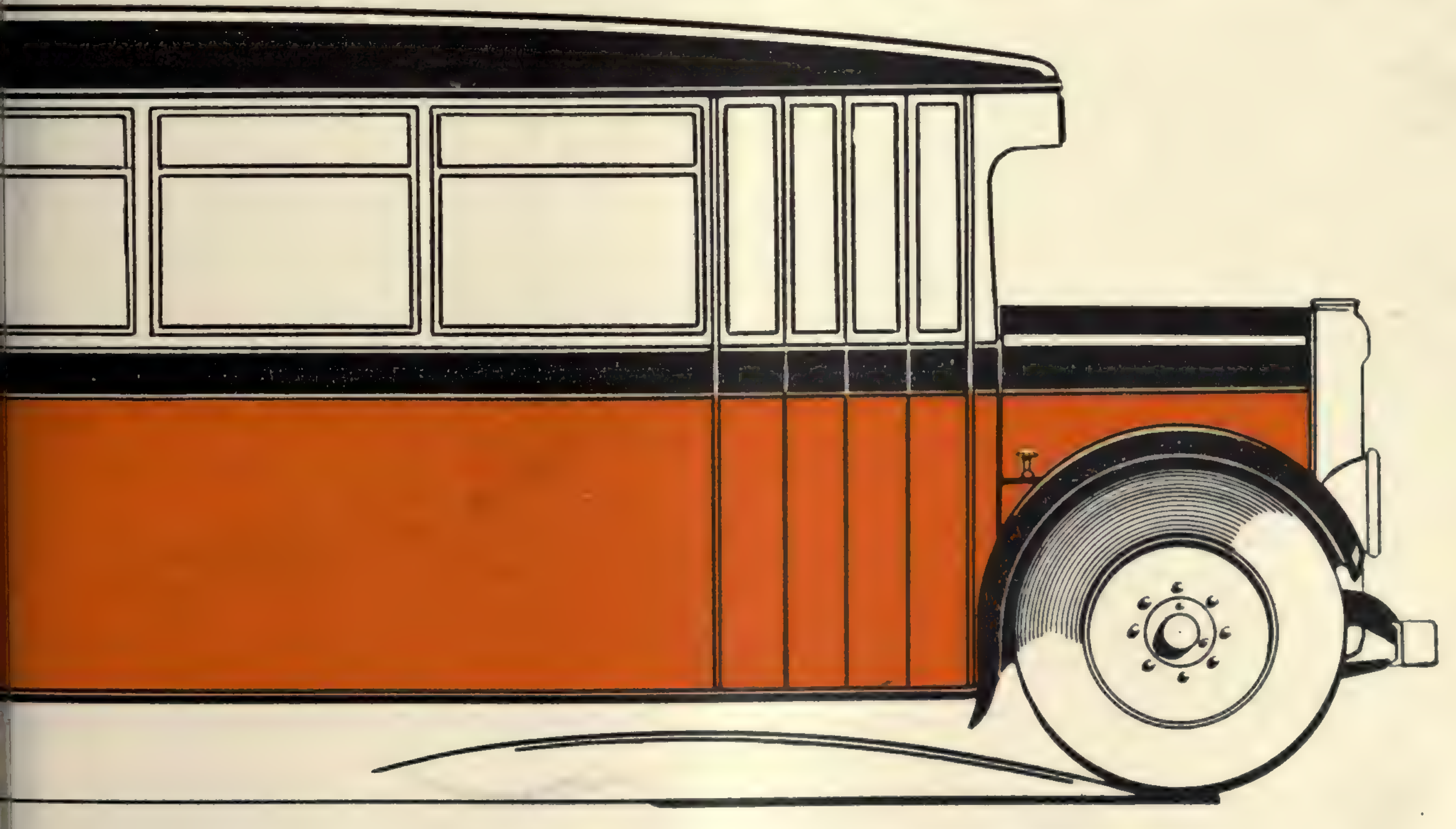
in design and built of *proven units* that have been time-tested in

Orders have already been placed by America's largest operators for over 400 chassis and complete coaches of the "Z-240" Type

millions of miles of heavy duty coach service . . .

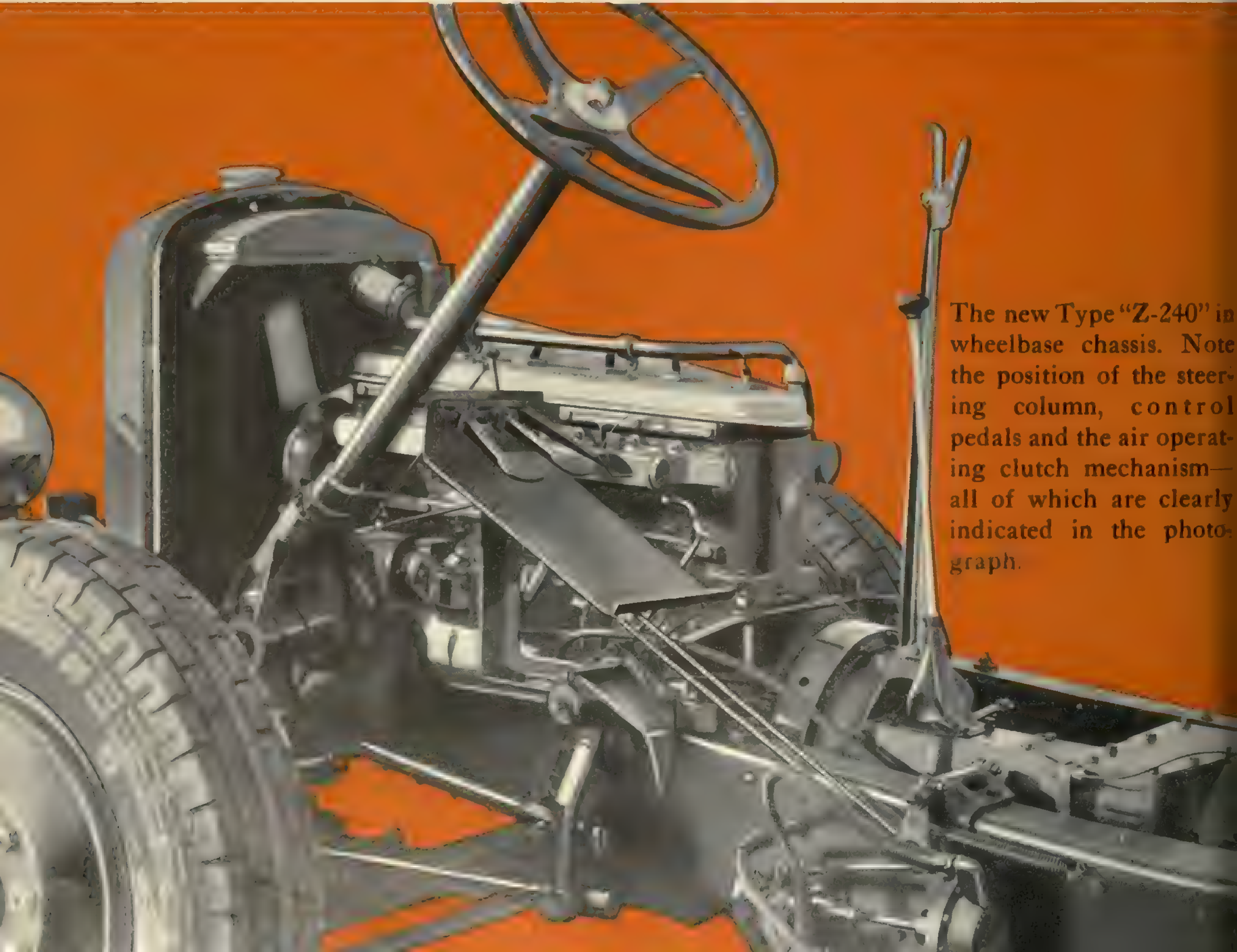
A *real* mass transportation vehicle with *more power* and *greater strength* and *bigger load capacity*





More Power: Better Motor Lubrication—Longer Motor Life	New aluminum cylinder head gives higher compression ratio and more power. Oil pump capacity increased 50%. Oil pumps, oil cleaner and improved oil rectifying system result in more power, better lubrication and longer life.
New Frame Design	Insuring greater strength with less weight.
Air Clutch Relieves Driving Strain	An air-operated clutch; responds immediately to a slight pressure on the pedal. Relieves driver of fatigue and results in easier, quieter handling.
Larger Wheelbase Yet Shorter Turning	240-inch wheelbase but only 36 feet turning radius. Easy to handle in traffic.
Easier Steering	Improvements in both steering gear and mounting method give almost passenger car ease of steering.
Better Cooling	A larger radiator of greater cooling capacity, with improved shock-proof mounting.
Easier Riding	Balloon tires, 40-in.x9.75-in. Bigger springs, 48-in.x 3½-in. front, 64-in.x4-in. rear, with new type mounting. Lovejoy shock absorbers on rear.
Air Brakes	On all four wheels. American Brake Blocks and heavy gun iron drums all around. Emergency brake, manual control type, operating on two gun-iron drums.

General Motors Truck Company . . . . Pontiac, Michigan



The new Type "Z-240" in wheelbase chassis. Note the position of the steering column, control pedals and the air operating clutch mechanism—all of which are clearly indicated in the photograph.

SELF SERVICE CARS

The National Pneumatic Treadle follows the modern trend inasmuch as it permits the rider to open the exit door for himself when the car has come to a full stop. Riders like it—operators benefit by it—it is the final word in modernization.

NP

NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York

General Works, Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

Which way?

the sign doesn't show it . . . . . . !

Better public relations come only from constant efforts to please. They come from continued efforts to improve the service, and to make it equal to or better than competing forms of transportation.

Rough, irregular track, with cupped joints and broken paving, leads straight to the financial scrap heap. Smooth, quiet-riding, jointless, track on which riding is a pleasure, is just as important in the modernization program as attractive and luxurious rolling stock.

And Thermit welding is the way to get such track—*and keep it*. Once Thermit welded—and it's done for good.

THERMIT

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

Use "NATIONAL" SHELBY
Seamless Steel Trolley Poles

THE "NATIONAL-SHELBY" Trolley Pole is regularly manufactured in two designs, Standard "A" and Standard "B."

Standard "A" pole design is suitable for all ordinary service and makes the lightest pole it is practicable to manufacture or use.

Standard "B" pole, speaking generally, is 20 per cent heavier and 50 per cent stronger than the Standard "A" pole. This design is intended to meet the most severe service conditions.

Both are made from the same grade of Open Hearth steel, and in manufacture the material is cold drawn and annealed in such a way as to give a good grain structure and insure sufficient elasticity.

Special designs, varying in some or all particulars from the standard designs, are made to meet special requirements.

NATIONAL TUBE COMPANY • Pittsburgh, Pa.
Subsidiary of **United States Steel Corporation**

27 Out Of 34

Placed Repeat Orders

THIRTEEN years ago we gave, *gratis,* 34 Tool Steel pinions to 34 different electric railway companies who had not before used them.

We recently checked up. Out of the 34 companies 27 have placed repeat orders. The 27 companies have purchased a total of 628 gears and 2,057 pinions.

Thus is shown the fact that *79% of the companies who accepted the trial pinion have ordered more.* Not once but several times.

Surely such a recommendation proves Tool Steel Gears and pinions "best by test."

The Tool Steel Gear & Pinion Co.
Elmwood Place, Cincinnati, Ohio

THE DAYTON INTEGRAL SYSTEM OF TRACK AND PAVING STRUCTURE IS IN YOUR BUDGET NOW

The Dayton Integral System of Track and Paving Structure Gives You Lasting Track

The Dayton Integral System of Track and Paving Structure Is in Your Budget Now

Whatever your budget for track renewal or extension—it is adequate for Dayton Integral Track.

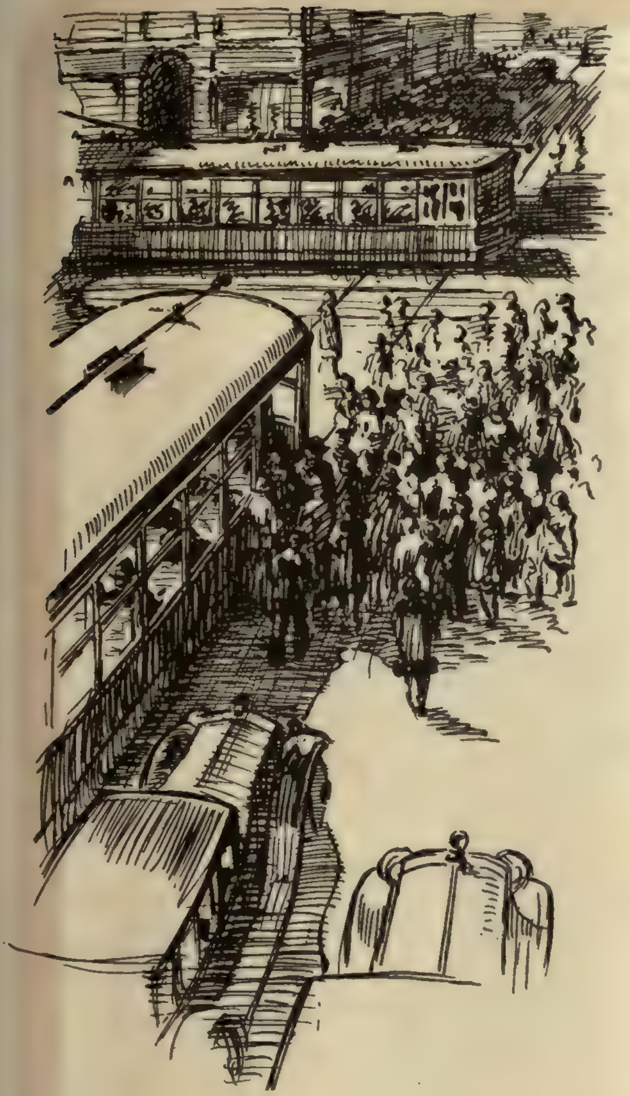
Engineers who have used it will tell you that it is never more expensive than any other good track construction—and often less expensive.

Hence, you can have this lasting track at the same cost as short life track.

The Dayton Integral System unifies track and paving structure into a single, durable whole—one base for track and paving—no trouble or maintenance on either for years.

It will solve your track problem as it has for properties all over the country.

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO



10 to 40

stops per mile—

How about *your* wheels?

Cars in city service stop that often, and stop quickly. Wheels and Axles must give unusual service to prove economical on such lines.

"Standard" Wheels, Springs and Axles are chosen for the nation's leading railway lines. They answer service demands.

Rolled Steel Wheels *Armature Shafts* *Axles and Springs*

"FOR EVERY TYPE OF CAR

IN EVERY TYPE OF SERVICE"

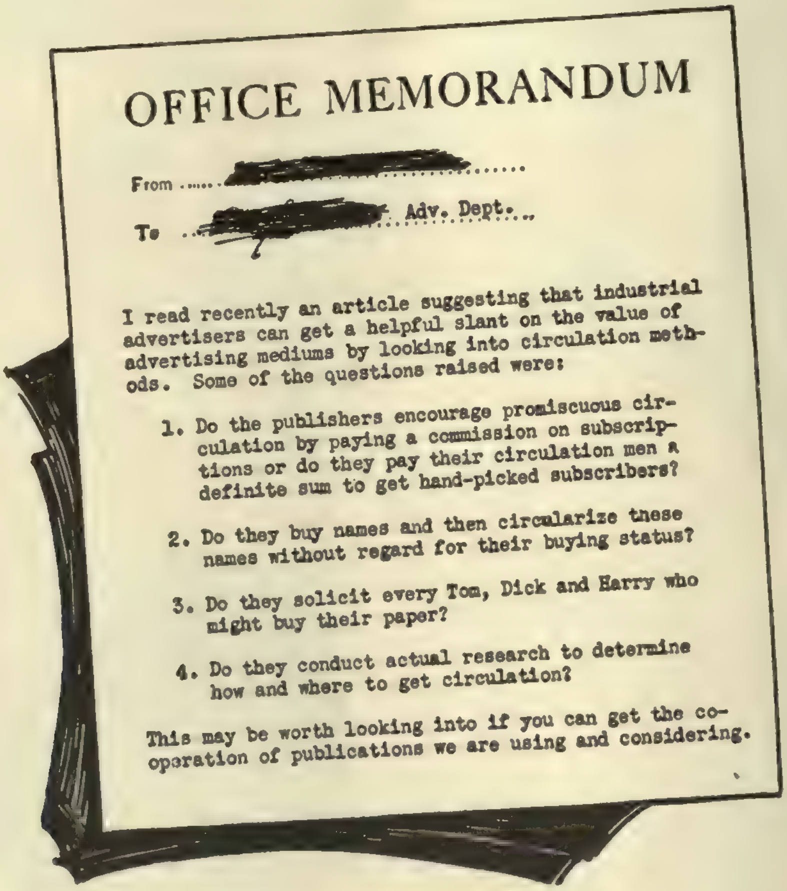
STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

BRANCH OFFICES:
CHICAGO NEW YORK PORTLAND PITTSBURGH
ST. LOUIS HOUSTON RICHMOND SAN FRANCISCO
WORKS: BURNHAM, PA.

This is one of a series of McGraw-Hill advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

Can a circulation statement give the advertiser everything he needs concerning a medium?



OFFICE MEMORANDUM

From [redacted]

To [redacted] Adv. Dept.

I read recently an article suggesting that industrial advertisers can get a helpful slant on the value of advertising mediums by looking into circulation methods. Some of the questions raised were:

1. Do the publishers encourage promiscuous circulation by paying a commission on subscriptions or do they pay their circulation men a definite sum to get hand-picked subscribers?
2. Do they buy names and then circularize these names without regard for their buying status?
3. Do they solicit every Tom, Dick and Harry who might buy their paper?
4. Do they conduct actual research to determine how and where to get circulation?

This may be worth looking into if you can get the coöperation of publications we are using and considering.

AT McGraw-Hill circulation headquarters in New York there is a large map. On it here and there are colored pegs which show what circulation we do not have—plants, utilities or service organizations whose buying power should be covered by a McGraw-Hill publication.

No one—publisher or manufacturer—can map his prospects in this way without continuous research.

Between 50 and 60 salaried McGraw-Hill circulation men participate in this research to locate, rate and get only those men whom industrial advertisers are after for business.

Advertisers and advertising agents who are interested in industrial markets and the electrical and radio trade are welcome to make a personal investigation of McGraw-Hill circulation methods. Group visits to headquarters are being made all the time.

—The publishers

102 YEARS OF MANUFACTURING EXPERIENCE

Rattan car seat webbing may be ordered through any H-W sales office

No. 327-M

FOR INTERURBAN NEEDS

THIS Heywood-Wakefield seat is designed for the modern type of interurban service where comfort is now so important. It has been selected for both new cars and for replacement use.

It has deep, double spring cushions shaped to allow more leg freedom. Mechanism rails are set in. The individual backs are properly pitched for comfort.

Our car seating experts will be glad to help you decide on the best seating equipment for your needs. This service is free through any H-W sales office.

If you have not received a copy of our new Bus Seat Catalogue, write for it.

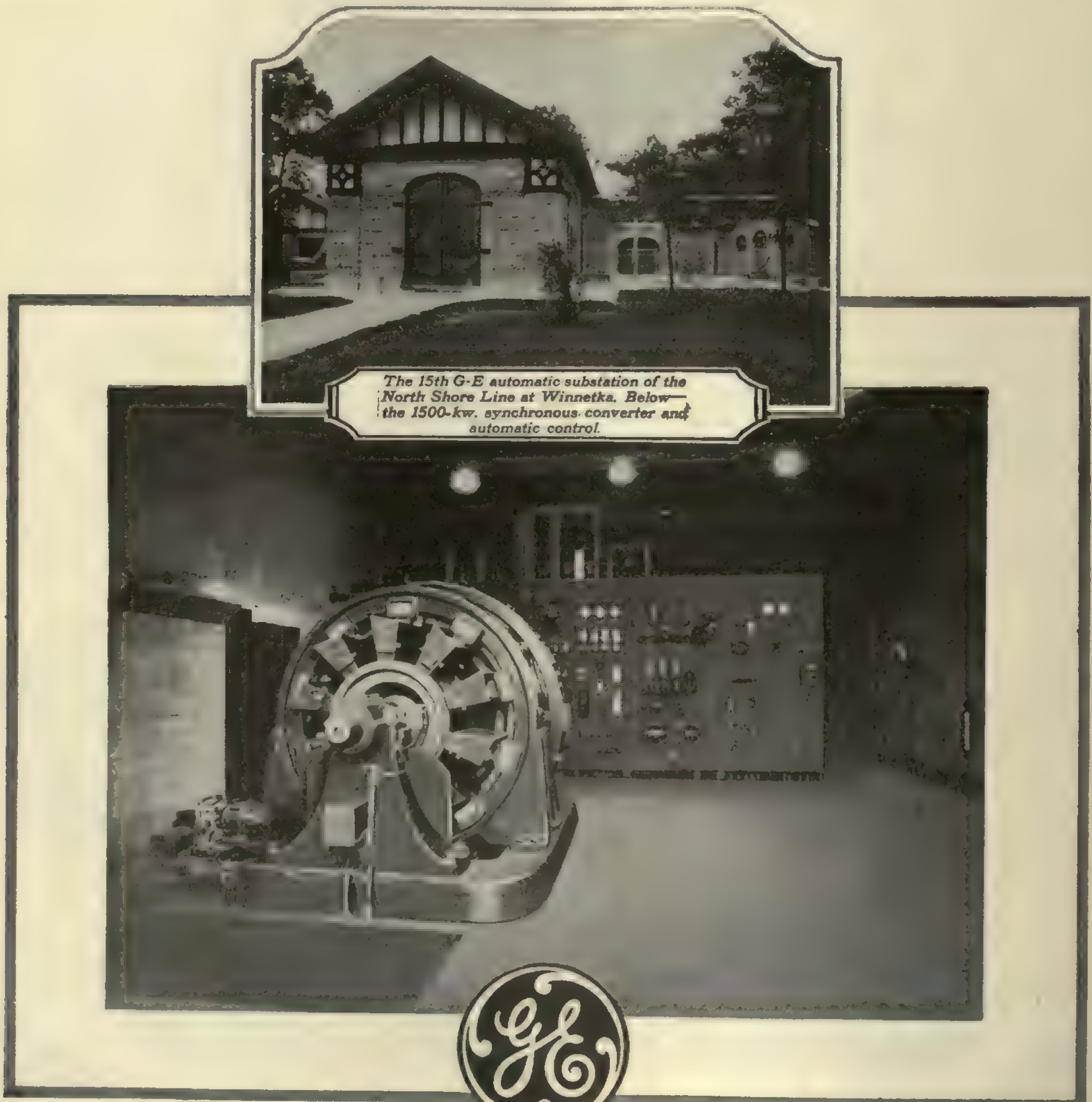
Heywood-Wakefield
REG. U.S. PAT. OFF.

Heywood-Wakefield Company, Wakefield, Mass.; 516 West 34th St., New York, N. Y.; 439 Railway Exchange Bldg., Chicago, Ill. H. G. Cook, Hobart Bldg., San Francisco, Cal. The G. F. Cotter Supply Company, Houston, Texas. John R. Hayward, Liberty Trust Building, Roanoke, Va. The Railway & Power Engineering Corp., 133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada.

The 15th G-E Automatic Substation for the North Shore Line

ON the Chicago, North Shore and Milwaukee Railroad, 15 of the 20 substations have been made completely automatic by installing G-E equipment throughout. Coördinated power facilities, greater efficiency and dispatch in maintaining continuous service, unified train control—these are being attained by this progressive road.

The attractive, modern structure at Winnetka houses a G-E 1500-kw. synchronous converter and complete G-E automatic control. The North Shore Line has had extensive experience with automatic substations. This road's choice of G-E automatic equipment is the result of its reliability and economy.



The 15th G-E automatic substation of the North Shore Line at Winnetka. Below—the 1500-kw. synchronous converter and automatic control.

130-15

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

McGraw-Hill Publishing Company, Inc.
James H. McGraw, *Chairman of the Board*
Malcolm Muir, *President*
H. C. Parmelee, *Editorial Director*

CHARLES GORDON, *Editor*

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Unproductive Transportation Charges

FIXED firmly in the minds of many people is the idea that, because their gross revenues are large, the companies rendering public transportation service must be enormously wealthy. It is usually popular with the public, therefore, to demand that transportation agencies make huge expenditures for purposes that do not in any way benefit the companies themselves. At one time this was done largely by taxation of one sort or another. Shining examples of this practice are the park tax paid by the United Railways & Electric Company of Baltimore, Md., and the school tax paid by the steam railroads in New Jersey. Numerous other taxes of a similar nature have been imposed, differing in detail but not in principle.

The energetic campaign carried on by the transportation industry in recent years for relief from unreasonable tax burdens has at least prevented new inroads, although it may not have accomplished much in the way of actual relief. But now the incursions into the treasuries of the transportation companies take new forms. The carriers are subjected to countless demands for "improvements" that neither increase their revenue nor enable them to render better service. For example, the street railways are asked to relocate their tracks for the convenience of the general public, but at the expense of the companies. The steam railroads are asked to build new and enlarged stations when the old ones are entirely adequate. Both steam and interurban electric lines are subjected to constant demands for the elimination of grade crossings, although the conditions which make this necessary are no fault of theirs.

Of course, transportation companies desire to be good citizens in the communities they serve and to co-operate to the fullest possible extent in all public improvements, but they have only one source of income—the passengers and shippers who use their lines. When they undertake costly improvements that neither increase their revenue nor reduce their operating expenses, the costs must eventually be reflected in the price paid by the users of the service. This fact is frequently overlooked by those who clamor loudly for improvements. Absurd as it may seem, it is not unusual to find the same individuals demanding improvements, on the one hand, and encouraging competition on the other.

Earning Public Good Will

PRINTED records often are powerful not so much in what they say as in what they convey. Thus, to those who have been following the course of recent events, the item "Springfield Work Commended" published in the JOURNAL for Feb. 16, perhaps conceals more than it conveys. The Mayor said that Clark V. Wood, president of the Springfield Street Railway, has steadfastly kept every promise made to the city. This most important reference to the street railway he tucked away in a municipal review in which the work of the company was itemized.

It was a gentlemen's agreement into which the New Haven Railroad as the owner of the Springfield system entered for the expenditure of $2,000,000 for rehabilitation in Springfield, under which in 1928 $500,000 alone was spent for new cars, motor coaches and similar equipment. The Mayor is hard headed enough to know that even the expenditure of $2,000,000 within two years has not made the Springfield Street Railway perfect, but it was a real compliment that he paid the management. And it was well deserved. The railway has kept faith with the city. And the city has kept faith with its railway.

Not so long ago the relations between city and company were not so cordial. That was because neither thoroughly understood the other. It needed only the kind of confidence that grew out of the conferences held several years ago over the matter of rehabilitation to iron out many misunderstandings. The Springfield case offers a striking example to this industry. Incidentally it is a testimonial to the efficacy of a municipal management which has recognized that it, too, has obligations to its transportation system, which if ignored must inevitably act unfavorably upon the entire community.

Another Phase of New York's Traffic Problem

LOADING and unloading of commercial vehicles in the city streets cause traffic congestion. This fact is being realized to its fullest extent in the nation's largest city. The merchants of New York have for years looked at the receipt and delivery of goods as a disagreeable detail required in all business, and have been totally blind to the ever-increasing traffic congestion caused by it, and its corresponding bad effect on their business. The realization of this congestion has at last been forced on them by the sheer lack of facilities to deliver and receive goods.

Suggestions and recommendations are now being prepared to improve the situation. Night delivery of certain commodities is being considered. Regulation of end-to-the-curb loading of trucks where side loading is possible has been mentioned. Elimination of street delivery of the major portion of construction material for the erection of new buildings would considerably decrease traffic problems. A change in the building code is suggested, which would require the provision for adequate elevator and off-street shipping and receiving and storage facilities in all new buildings. These suggestions are all good, and will be effective in preventing a growth of traffic congestion. They would have been of inestimable value had they been enforced ten or fifteen years ago.

It is apparent that only drastic regulations, entirely preventing street loading and unloading, will relieve this traffic situation. Such an ordinance would require the construction of a ramp and the establishment of a shipping, receiving and storage plant in the basement of practically every large building in the city. This city's major traffic problem has been created by the erection of large buildings. Why, then, should not the owners of such property be required to relieve the congestion for which they are responsible? However, considering the influence of such a body of property owners and their usual adverse attitude toward enforced expenditures, is it not reasonable to doubt if such an ordinance could be passed? Whether or not this plan can be worked out satisfactorily, does it not behoove other cities of growing importance to consider carefully ways and means of circumventing this mess into which Father Knickerbocker has stepped while looking skyward?

Mixing Fiction With Facts

EDWIN LEFÈVRE has been writing a very interesting series headed "Bulls on America," for the *Saturday Evening Post.* He is a veteran Wall Street commentator. His recent articles have been mostly words of warning, and his predictions presaged the spectacle of liquidation which is apparently now taking place.

It is a needed warning that Mr. Lefèvre has uttered, but it is not so much with that phase of his recent comments that the JOURNAL is concerned.

In discussing the inability to gage accurately the full effect of certain economic changes in the Feb. 16 issue of the *Saturday Evening Post,* he says "just as the trolley has been superseded by the bus and no one yet knows exactly what will happen to our passenger transportation business," etc. Incidentally, this is a statement only slightly different from one made by Mr. Hughes, another financial writer, and repeated in the *Literary Digest.*

How men like Mr. Lefèvre come to say that the trolley has been superseded by the bus when even the most radical bus enthusiast would scarcely make that charge, is difficult to understand except as an evidence of sheer ignorance of the subject. The electric railway business is a $6,000,000,000 industry. It has gone through many difficulties, but the trolley has not been superseded by the bus. Where are the eyes of the writers of these statements? They can't be expected to know the history of all industry, but the facts contradictory of what they write are so apparent that charity toward them becomes difficult to maintain.

To recapitulate the facts of this industry for the benefit of this industry is not necessary, but for the benefit of Mr. Lefèvre and other commentators it would be well to repeat that more than 300 electric railways in the United States and Canada are now operating approximately 10,700 buses in conjunction with their rail services, and that some 50 additional companies have entirely replaced their rail service by substituting more than 500 buses. Buses owned by these electric railways operated 300,000 miles during the past year and carried more than 1,000,000,000 passengers. Electric railway cars in the United States last year carried more than 15,000,000,000 passengers. These facts are all on public record. Mr. Lefèvre and others who venture to cite experiences of the transportation industry as the basis for their conclusion owe it to the publications to which they contribute to distinguish between fact and fiction.

Austrian Commission Disagrees on Intangible Values in Electrification

RESULTS on the electrically equipped lines of the Austrian State Railways have been so good that one may be astonished at the opposition offered to extensions eastward to Vienna. However, there is a very good reason in the cost of capital in Austria. It is still so high there that the government has to allow 8.3 per cent for interest, plus a 30-year amortization reserve. It takes strong arguments, indeed, to leap this high barrier.

The pros and cons are set forth in an article published elsewhere in this issue. From this it will be seen that Austria already has 366 km. (227 miles) of electrified trunk line, extending from the Swiss border to Saalfelden, with another 112 km. (69 miles) to Salzburg for completion in mid-1929. Plans have been made for continuing 312 km. (193 miles) on to Vienna. Because of the great outlay required, the Minister of Commerce and Traffic put the estimates of the State Railways and of the manufacturers before a commission for report.

As with most commissions, there is a majority and minority report. The majority favors electrification; the minority does not. While the members are in agreement on costs and the unprofitableness of electrification as regards direct benefits, they differ widely on the indirect benefits. An analysis of the arguments used develops another example of what the philosophers call "the will to believe."

The electric men figure more mileage per vehicle to be a great advantage, but the steam men see only that the brakeshoes will wear out faster. The electric men see airplanes as real competitors for long-haul business, and say: "We must move faster and more pleasantly." The steam men see in this advance of transportation a reason for assuming that everything will be different 30 years hence—so why invest money in electrification? The electric men point out that removal of smoke and dirt increases patronage and raises property values for taxation. The steam men clutch at some still mythical smokeless locomotive and assert that electrification isn't needed after all.

The electric men see that the electrifications of neighbor states will keep down Austria's pro rata of through business unless that country electrifies its lines, but the steam men see only the situation within their own country.

The electric men see greater safety with an electrified track, particularly in signal visibility, but the steam men grasp the opportunity to point out that wires and poles do not help visibility in any respect. The steam men also score in discussing the hazards from high-tension wires.

Neither side, however, quotes figures. The electric men make a strong point in stressing the value of greater capacity of tracks and yards due to higher-speed operation. The steam men ignore this but argue that manufacturers will not pay the higher cost of electrified sidings. Preconceptions rather than figures are also allowed to govern when the steam men assert greater reliability for individually powered trains than those dependent upon outside power supply. Why could not the commission have made a comparison of delays before and after electrification on one of its own electrified divisions? The steam men are blind to the fire hazard from sparks and burning coal but see very clearly that high-tension wiring is a pyromaniac.

It is rather amusing that electric railway extension should be asked to wait until locomotive standardization has been obtained, when the very same report suggests the purchase of steam locomotives much better than the present type! The steam men argue that electrification would produce greater stresses in track and draft gear, and then go on to suggest more powerful steam locomotives that would do the same thing. After all, the real objection to extension of electrification is the high cost of capital. It is to be hoped that some reasonable refunding plan will be acceptable to the financiers, but amelioration in this respect can come only with the continuance of domestic peace. It may be that another year will produce that ½ per cent to 1 per cent drop in interest that means so much to this project.

The Place of Rapid Transit in City Planning

WELL-DESERVED criticism has been directed at the city of New York in connection with its transit planning, by Daniel L. Turner, consulting engineer for the New York Transit Commission. His main thesis is that transit facilities must be furnished in advance of population and in the way it is desired to develop the city.

On the whole, Mr. Turner is right. Transportation is an inherent and a most important part of the general problem of city planning. Best of all, it appears now that New York will so regard it in the future, as Edward M. Bassett, authority on zoning and city planning, has submitted to Mayor Walker recommendations for a permanent city planning board of three members to supervise all improvements providing for the city's rapid growth.

Of course, it would be foolish to imply that the routes of the rapid transit lines already built were not carefully planned. That is not the fact, but it is a fact that they were not planned in accordance with the ideas behind the more inclusive program proposed for the future under the master plan which would provide for the city's growth until a population of 18,000,000 is reached. To this proposed planning board would be submitted all proposals for streets, highways, street grades, bridges, tunnels, viaducts, parks, parkways, playgrounds, sites for public piers, routes for railroads, ferries and other public utilities.

Similar master plans are in existence in 300 cities. Only as the planning of transit facilities is made a part of this work are these programs really complete. In the past too often, far too often, as Mr. Turner indicates, the construction of transportation facilities and their expansion have been spasmodic. In consequence much waste, duplication and unwise construction have resulted.

As Electric Railway Journal has pointed out repeatedly, development of comprehensive transportation plans as a part of the general city plan would permit each step in construction to be made as a part of a broad program. Construction budgets could thus be anticipated and the conditions of financing improved. Of course, the larger the city the greater the need for the most systematic planning, but no city sufficient in size to sustain an organized transportation system can afford not to consider that system as one of the most important factors affecting its welfare. Cities need to plan, but to plan only on a basis that takes into account a program shaped to the best interests of the city as a whole. Certainly they will continue to suffer in a civic way in direct proportion to the extent that they ignore transit requirements.

Potential Possibilities of Steam

STEAM is inherently suitable for the propulsion of transportation vehicles. It has been said that if the same degree of research and developmental effort had been put behind the steam engine for vehicle propulsion that have been applied to the internal combustion engine, automobile drive today would be far in advance of its present state. The abundance of power and flexibility that are available with steam, high torque of the steam engine at low speeds, its mechanical simplicity and small number of moving parts make it superior where these requirements are of major importance.

With the introduction of the gasoline engine as a drive for the automobile it became necessary for the owner who drove his car to become familiar with its construction. As the use of the automobile grew, machinists, blacksmiths and tinkers soon were doing a large business in the upkeep of the early models. Thus the future success of this type of motive power was assured by the growing attention given it by its users. Steam drive, on the other hand, was confined to a relatively small number of high-priced cars, and while its development was attended with certain technical difficulties, not the least of its handicaps was that the American public had become so well acquainted with the principles and the methods of maintenance of the gasoline automobile engine.

The potential possibilities of steam for the propulsion of buses, however, have continued to attract the interest of engineers ever since this type of transportation vehicle began to assume a position of major importance. More than any other free-wheeled vehicle, the bus demands a reliable source of power. It is also necessary to have the engine of sufficient size to provide rates of acceleration comparable to the lighter constructed, less continuously operated automobile. Steam provides these features and in addition offers the prospect of cheaper fuel and reduced maintenance because of comparatively simple construction.

These features, combined with the acute demand for faster schedules on buses, put steam in the position of a potential contender in the field of bus operation, and its successful development in this field will be an important factor in expanding the use of the bus in community transportation. True, there have been numerous unsuccessful attempts to develop steam drive for this purpose, and it will require considerable research to make it compete actively with the internal combustion engine backed as the latter is by seemingly endless resources. In fact, it is doubtful if the bus industry alone could support such an extensive development program as seems necessary.

But another incentive to the development of steam drive that is coming rapidly to the forefront is aviation, imposing still more severe power requirements than any other form of transportation. Here there must be not only high output per pound of weight, but high continuous output as well, and, above all, reliability. Self-starting and non-stalling characteristics of the steam engine would eliminate one of the greatest hazards of air travel, i.e., a stalled motor, particularly just after taking off the ground.

Thus in the background of steam drive development for buses loom the almost limitless possibilities of aircraft. Undoubtedly here is an incentive which is growing greater almost daily. Under the stimulus of such a field of application, steam may again come back into its own as a serious contender with the internal combustion engine.

Passenger train on the Salzkammergut branch line electrification, Austrian State Railways

Austro-Swiss Electrification

Progressing Rapidly

Service already being given from Geneva to Saalfelden, a distance of 472 miles. A total of 542 miles will be completed by summer of 1929. Salzburg-Vienna line, 193 miles long, being considered

IN 1919, or within a year after the disastrous war which disrupted the Austro-Hungarian Empire, the new-born Austrian Republic took up the task of electrifying the State Railways. Rich only in water power, the republic was anxious to exploit it for the twofold end of reducing costs and of enhancing the attractiveness of travel in Austria.

Despite the harrowing years of fiat money, usurious loans and economic readjustment, electrification has gone forward in accord with the program set forth in the electrification act passed July 23, 1920. As a matter of fact, work was actually started during 1919. By the summer of 1929, or in practically a decade, Austria will be operating 296 miles of electrified main line route from the Swiss border at Buchs to the city of Salzburg, famous for its music and drama festivals.

This additional electrification will place the Paris-Zurich-Salzburg route to Vienna on a parity with the competitive Paris - Stuttgart - Munich - Salzburg route which required only 27 hours traveling time instead of the 28½ hours of the first route when steam-operated. The electrification to Salzburg was made all the more imperative because the planned electrification between Salzburg and Stuttgart will cut the running time to 25½ hours or less.

Before the end of 1928, the Austrian State Railways also expect to complete the 38-km (24 miles) Innsbruck-Brenner connection with the Italian State Railways. Besides these lines, there is the pioneer Salzkammergut branch line, totaling 107 km. (66.3 miles) of single track in operation since 1925. By the summer of 1929, the Austrian State Railway's electrified lines will total

366 route miles. The Schwarzach-St. Veit and Spittal-Millstättersee lines also have been chosen for electrification, but so far only the hydro-electric supply has been taken in hand.

Capital and Amortization Charges 10 per Cent

The capital charges, including amortization, on the electrifications already undertaken, have approximated 10 per cent. Officials of the State Railways estimate that the future charges will be about 8.3 per cent. The principal question to be decided by the Austrian Parliament, which has the final say, is whether it would be economically justifiable to electrify from Salzburg to Vienna for 312 km. (193 miles) and also from Vienna to the important industrial city of Graz, 211 km. (132 miles).

Like the Swiss electrification, the Austrian State Railways standard is single-phase, 16⅔ cycles, with an average line potential of 15,000 volts and a maximum of 16,500 volts.

The first main line work was begun in 1923, covering 20 km. (12.4 miles) west of Innsbruck. Thereafter, 60 to 70 km. (37.2 to 43.4 miles) were electrified per annum. An extended account of the situation up to the end of 1925 was published in the issue of this paper for June 5, 1926. In the summer of 1928, 366 km. of track were in operation and 112 km. more were to be completed by the summer of 1929.

Through coaches over the line from Buchs to Saalfelden, 70 miles west of Salzburg, are now operated from the electrified divisions of the Swiss Federal Railways. Later this year the traveler can make an all-electric trip from Geneva to Salzburg, a distance of 874 km. (542 miles) without changing cars.

Various types of overhead construction have been installed on the different divisions. Experience has indicated that the Austrian-Bergmann design of gas-pipe bracket construction, as applied between Feldkirch and Bludenz and on the Salzkammergut line will be most satisfactory for general use. These brackets have two double-petticoat insulators with flashover ratings of 85,000 volts dry and 53,000—81,000 volts wet. The insulator for the upper horizontal member of the bracket can rotate in its fixture. The insulator for the diagonal or strut member has a pipe sleeving fixture to permit vertical movement of the diagonal.

On tangents, the poles are set at intervals of 60 m. (197 ft.) The contact wire over the running track is of 100 sq.mm. cross-section and over the switching tracks is 65 sq.mm. with tensions of 600 kg. and 390 kg. respectively.

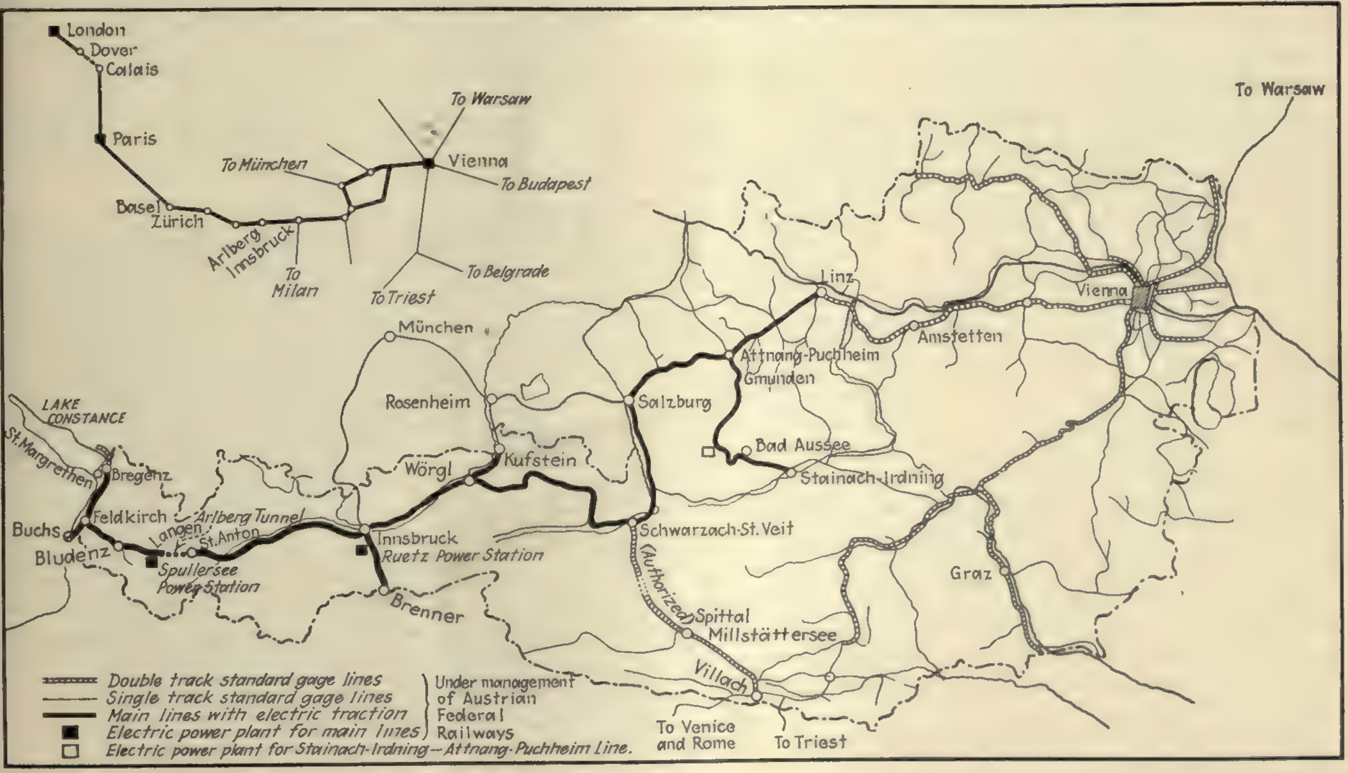
The steel catenary is 35 sq.mm. except for 50 sq.mm. at stations. It is usually under a tension of 600 kg. (1,320 lb.), but at stations it is rigidly anchored.

Electrification Speeds Up the Freight Service to Steam Passenger Speeds

The steepest grades on the main line are on the Arlberg division (Innsbruck-Bludenz) over a stretch of 136 km. (84.3 miles). This portion was opened in May, 1925. After electric locomotives were put in service on this division, freight trains were speeded up from 15 to 30 km. per hour (9.3 to 18.6 m.p.h.). This new maximum is greater than the speed of the former passenger train when operated by steam. The improvement on this stretch alone has been of noticeable help in competing for traffic between Paris and Vienna, with the South German lines via Salzburg, Munich, Stuttgart and Strasburg.

Another important advantage developed in electric operation is the greater effective capacity of train yards, which had grown to be inadequate with steam. In some districts, the expansion of such yards would be a very costly matter.

By 1928, the Austrian State Railways had in use or on order some 124 locomotives of eleven different types,



Electrified lines from the Swiss border into Austria

Austrian State Railway's freight locomotive of design shown in use on the Mittenwald Railway

two of which were Kando single-phase, multi-phase design for experiment. The service weights of locomotives varied from 55.4 to 118 metric tons; and their tractive effort from 55.4 to 89 tons. Hourly ratings ranged from 950 to 3,000 hp.; continuous ratings from 775 to 2,000 hp.

The earlier locomotives weighed only 14 metric tons per driving axle, then 15.2 tons and now up to 18 tons on rebuilt locomotives. Normal schedule speeds are on the order of 45 to 50 km. an hour (27.9 to 31 m.p.h.), but passenger trains attain a maximum speed of 80 km. an hour (49.6 m.p.h.) on level track.

All power is derived from hydro-electric plants as follows:

	Kilowatt Units in Use		Kilowatt Units Eventually	
Stubach	4	5,300	6	5,300
Mallnitz	2	3,300	4	3,300
Achensee	3	5,300	4	5,300
Ruez	2	2,200	2	2,200
	1	5,300	1	5,300
Spullersee	4	5,300	6	5,300
Total	16	74,600	23	107,700

EXPERTS DIFFER WITH REGARD TO SALZBURG-VIENNA CHANGE

In February, 1928, the Minister of Commerce and Traffic appointed a commission of eight steam, electric and financial experts to report on the feasibility of electrifying the Salzburg-Vienna continuation of the main line on the assumption of 20 per cent more traffic than was carried in 1926.

The cost of money was placed at 8.26 per cent, of which 7.3 per cent was for interest and 0.96 per cent for amortization on a 30-year basis.

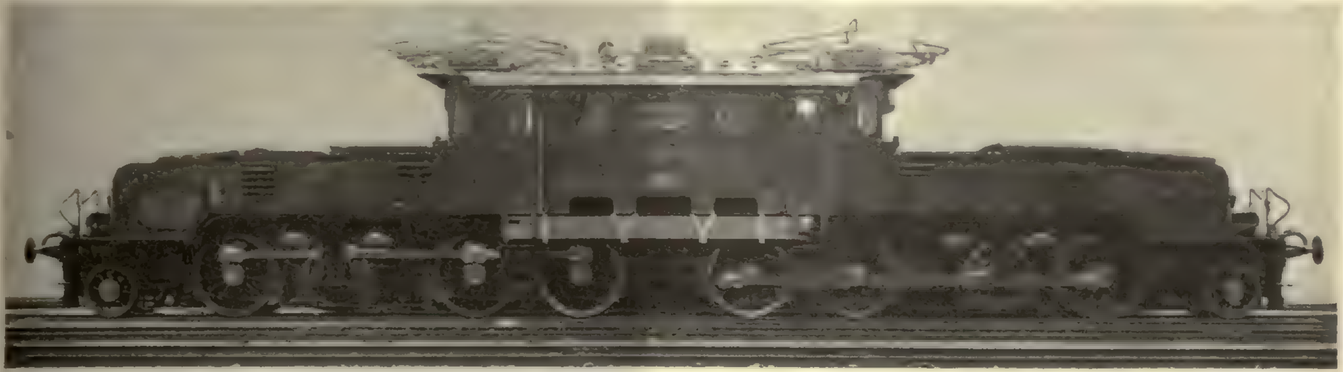
As matters stand today, the Austrian State Railways have almost no fixed charges exclusive of the investment in electrification. As of Jan. 1, 1925, the railways were valued at 2,818,782,000 schillings (14 cents to the schilling) of which all but 87,790,000 schillings steam investment had been written off. Extensive electrification would change this picture, especially in regard to amortization.

Comparison with electric operation was made more difficult by the fact that the State Railways had not been making any regular allowance for depreciation but had made renewals on a more or less arbitrary basis.

If further electrification were put through, said the commission, the track structure should be strengthened to take locomotives weighing 18 tons per axle and making speeds up to 110 km. an hour (68.2 m.p.h.). The 42 kg. per m. (84 lb. per yd.) rail used over most of the Salzburg-Vienna section should eventually be replaced by the type of rail used by the German State Railways, that is, 49 kg. per m. (98 lb. per yd.).

HOW COST ESTIMATES VARY FROM MANUFACTURERS' FIGURES

The cost estimate of the State Railways was 200,000,000 schillings ($28,000,000) on the basis of 2,890,000,000 gross ton-kilometer traffic or 20 per cent more than was moved in 1926. The estimate of the electrical manufacturers was 150,000,000 to 151,000,000 schillings ($21,000,000 to $21,140,000) on the basis of 2,240,000,000 gross ton-kilometer. The difference in traffic was due to the State Railways' assumption that at least five years would elapse before electrification was complete. The commission accepted the manufacturers' estimate



Mountain type high-speed passenger locomotive of 1100 series used by the Austrian State Railways

that five instead of six substations would do. The manufacturers estimate of investment for 110,000-volt tie-in lines was 1,800,000 schillings ($252,000) less than the State Railway's figures.

The cost of changing and conducting weak-current (telephone, telegraph, signal, etc.) circuits was set at 21,000,000 schillings ($2,940,000) by the State Railways but at only 11,400,000 schillings ($1,596,000) by the manufacturers. The State Railways also included 7,000,000 schillings ($980,000) rolling stock supplies.

Perhaps the greatest discrepancy was in the allowance for "contingencies." The manufacturers thought 2⅔ per cent or 4,000,000 schillings ($560,000) was enough; the State Railways figured 9 per cent or 18,000,000 schillings ($2,520,000). The argument of the State Railways was that there might be a considerable upward move in material and wages over the five-year construction period.

As regards weak-current circuits, the commission concluded that because of the need for placing such wiring in conduit, the cost assessed against the railways after allowing for the benefit to the State Telegraph and Telephone Department should be closer to the State Railways' estimate than the manufacturers, viz., 16,800,000 schillings ($2,352,000).

Since telegraph-telephone disturbance would be avoided by the radical but costly cure of conduiting the spacing of substations could be made to depend entirely on the factor of line drop. The specifications called for a contact line range of 10,500 volts minimum to 16,500 volts maximum, with the proviso that the equipment must be capable of giving full output at 12,000 volts line potential. This condition favored long intervals between stations.

Perforated concrete poles used by the Austrian State Railways for transmission line between Hopfgarten and Soll-Lenkental on the Wörgl-Saalfelden route

Section breakers as installed to date prevented the equalization of potential, but this could be remedied with special relays. Since the line voltage would not fall below 12,000 volts even with four stations, except for a rare congestion of trains, the commission agreed that five stations spaced an average distance of 79 km. (49 miles) would be adequate. The estimated transformer peak per station was placed at 11,000—12,000 kva. The total cost of the five substations was figured at 5,500,000 schillings ($620,000).

The commission decided that the initial supplies should be charged to capital account but that replenishments ought to be charged to operating account. The State Railways' allowance of 9 per cent for "contingencies" was accepted as correct, but owing to reductions in estimated investment, etc. the amount was placed at 15,000,000 schillings ($2,100,000) instead of 18,000,000 schillings ($2,520,000).

The commission refigured the total investment on the State Railways' assumption of 20 per cent more business (2,890,000,000 gross ton-kilometer). It calculated a cost of 174,500,000 schillings ($24,430,000) less a credit of 30,500,000 schillings ($4,270,000) for release of all steam equipment except switchers. This gave a total of 144,000,000 schillings ($20,160,000) as follows:

ESTIMATE FOR ELECTRIFICATION OF AUSTRIAN STATE RAILWAYS DIVISION BETWEEN SALZBURG AND VIENNA

	Schillings	
Overhead (850 track-km.)	25,200,000	
Substations (five)	5,500,000	
Rolling stock and supplies	76,300,000	
Electric heating	6,000,000	
Tower and service cars, etc	800,000	
Dwellings for employes	900,000	
Changes in railway's low voltage circuits, incl. signals	9,000,000	
Changes in state telephone and telegraph circuits	7,800,000	
Changes in dispatching and maintenance layouts	5,000,000	
Changes in bridges, tunnels, and other clearance measures	3,000,000	
Changes in lighting	500,000	
Management, supervision, etc	4,000,000	
Interest	15,500,000	
Contingencies	15,000,000	
Total	174,500,000	
Less credit for steam equipment transferred	30,500,000	
Total investment	144,000,000	$20,160,000

The rolling stock covers 127 locomotives totaling 10,358 tons with 5 per cent allowance for renewals totaling 60,905,000 schillings ($8,526,000); also 26 motor-car outfits of single and double units in equal number with 4 per cent allowance for renewals for 15,395,000 schillings ($2,154,000).

The steam credit item included an allowance for new steam investment that would be required to handle 20 per cent more business.

Power requirements for the Salzburg-Vienna division were placed at 100,000,000 kw.-hr. per annum of which 35,000,000 kw.-hr. would come at 4.05 groschen (0.567 cents per kw.-hr.) and 65,000,000 kw.-hr. would come at 6.3 groschen (0.882 cents per kw.-hr).

Electrification was expected to increase the schedule speed of expresses from 68 to 83 km. per hr. (42.2 to 51.5 m.p.h.) or 22 per cent; and of freights from 27 to 38 km. per hr. (16.7 to 23.6 m.p.h.) or a 40 per cent increase.

The saving in personnel was estimated as 4.6 per cent of the labor cost in 1926 for 20 per cent more traffic and without regard to possible one-man operation of locomotives. It is observed that permission to run one-man locomotives in certain classes of service had already been granted. Furthermore, the German State Railways had introduced one-man operation on lines under 70 km. (43.2 miles) per hour maximum speed. In Switzerland, most of the Loetschberg and Rhaetian trains were driven by one man; and the Federal Railways had lately tried some one-man locomotive operation.

In maintenance, the State Railways figured that electric would cost 78 per cent of comparable steam equipment, while the manufacturers figured only 55 per cent. The commission's estimate is 55 per cent. One factor in the commission's calculation was that the later electric locomotives would be maintained for 15 to 20 per cent less than the first electrics, which were rather light for the service.

WOULD ELECTRIFICATION PAY?

In answering the question: "Would this electrification pay?" the commission was unanimous in declaring that, disregarding the direct merits and demerits of electrification, it would not pay within the 30-year period allowed for amortization. Beyond this point, the members disagreed.

It was estimated that with overhead charges of 8.26 per cent included, the annual cost of electrified service would be 2,425,000 schillings ($339,500) greater than steam.

Five of the commissioners believed that after the loan charges of 11,894,000 schillings ($1,665,160) had been wiped out and the rolling stock renewal allowance doubled, there would be a gain of 8,100,000 schillings ($1,134,000) in favor of electrification.

The three minority commissioners hold that the charges on the cumulative deficit would not be met by the surplus obtaining after the 30-year period. They ask: "Who can tell what the cost of fuel or electricity will be 30 years hence; or what the transportation requirements will be at that time?" Electrical equipment might also be very different after a period of 30 years.

INDIRECT FACTORS IN FAVOR OF ELECTRIFICATION

The five who favored electrification set forth the following factors:

More milage per vehicle; also less rent for freight cars after modern, through brakes are adopted.

Fewer special or extra trains.

More flexible operation of suburban service with motor-car trains.

More effective competition with aeroplanes for long-haul, high-speed travel, and more effective competition with motorbuses for short-haul travel on short headways.

Removal of the smoke and dirt nuisance would greatly increase patronage.

Note type of concrete tower used to carry high-tension transmission line over contact line at Kitzbühel between Wörgl and Saalfelden, Austrian State Railways

More effective competition with foreign lines for greater pro-rata of mileage because of improvements in speed and cleanliness.

Lower painting and cleaning cost of cars, upholstery, stations, bridges, etc., due to elimination of smoke and dirt.

Less cost for uniforms (which are paid for by the railways—Editor.)

Decrease in maintenance of weak-current circuits because of enclosure in conduit.

One-man operation of locomotives on an increasing scale.

Postponement of third and fourth track construction because of higher schedule speeds.

Lower fixed charges at some future date in converting assumed 7.3 per cent loan to lower rate when financing conditions become more favorable.

Increased safety: First, clearer view of track and signals; second, fewer non-scheduled train movements; third, greater ease in making up time because of better rates of acceleration and higher speeds than steam; fourth, better control because conduiting permits longer-distance telephoning and better tie-up of signal towers, booths, etc.

Standard steel pole with tension take-up weights between Leogang and Hochfilzen on the Wörgl-Saalfelden route, Austrian State Railways

Elimination of dependence on foreign countries for coal.

More healthful working conditions for train and shop personnel.

Smoke and dust relief for cities along the railway.

Recapture of valuable yard space now needed for coal storage and tanks.

More effective use of track when freed from tenders and water cranes.

No more freezing troubles, especially of heating lines.

Favorable opportunity afforded for modernizing schedules and maintenance facilities.

Stimulation of home material and labor markets.

The minority members saw things differently as the following summary shows:

The money in the renewal fund of non-electrified divisions would not be available for some years because of the transfer of steam equipment from the electrified section to keep down investment cost. These steam divisions would therefore be compelled to operate with old, inefficient locomotives instead of buying better ones out of the renewal fund.

Less efficient use of personnel because of taking over surplus men from the electrified division.

Operating reliability would be decreased because interruptions of power affects whole divisions instead of single trains.

High-tension wires would increase employee hazards.

High tension would bring new fire hazards.

Greater hazard in crossing the right-of-way.

Visibility of signals decreased because of overhead wire and pole lines.

Greater difficulty in reaching the scene of an accident because a section may be dead.

Lack of locomotive construction designs based on long tradition.

Lack of flexibility on account of type of current, voltage and periodicity. (This ignores present Austro-Swiss operation—Editor.)

Greater stresses in draft gear because of heavier trains and greater acceleration.

Greater stresses in brake-rigging and wear of brakeshoes.

Factory owners would object to paying the higher cost of all-electric sidings. Such sidings would also interfere with existing cranes, derricks, etc., and increase hazards because of high tension.

The unfavorable financial balance with foreign countries would be increased from the present 7,000,000 schillings ($980,000) a year for foreign coal to 11,890,000 schillings ($1,664,600) for interest payments. There was hope, also, for more efficient use of Austrian brown coal in future.

Cost of capital would be excessive.

Modern steam locomotives with superheaters and smoke-consuming devices would do all that was expected of electricity, producing a saving of 5,155,000 schilling ($721,700) over electricity.

Indirect Advantages Justify Electrification Says Majority

In the opinion of the five majority commissioners, the indirect advantages of electricity are worth 1,500,000 schillings ($210,000) a year. This would reduce the electrical excess cost to approximately 900,000 schillings ($126,000) a year. After the 30-year amortization period, the gain from electrical operation would rise to approximately 9,600,000 schillings ($1,044,000) a year.

The initial extra electrical cost of $126,000 a year is held to be relatively small in comparison to the total gross of the Austrian State Railways. This was 566,000,000 schillings ($79,240,000) in 1926. Furthermore, increased traffic, and avoidance of higher wage and coal cost may be expected to change this deficit into a gain in a short time. A 10 per cent rise in coal would make steam operation cost 400,000 schillings ($56,000) more. On the other hand, a ½ per cent cut in interest return on conversion of securities would reduce the cost of the loan by 720,000 schillings ($100,800) a year.

A brief delay in electrification progress would not bring any important advantage but would disturb the labor and material market. A long delay would not be desirable in view of the electrification work of neighboring states.

The interim remaining until the completion of the electrification west of Salzburg gave ample time for the development of standards in maintenance and equipment. Delay, finally, would mean that any new steam locomotives ordered for the easy-grade Salzburg-Vienna division could not be advantageously adapted to the other, mountainous divisions.

While no interruption in electrification was desirable, the work could will be spread over a period of five years. This would make it easier to raise money, train men and shift steam equipment and personnel with less confusion. It would be most helpful to split 'the electrification as follows:

First year	Salzburg-Attnang-Puchheim
Second year	Attnang-Puchheim-Linz
Third year	Linz-Amstetten
Fourth year	Amstetten-St. Polten
Fifth year	St. Polten-Vienna

Comparison with Swiss conditions would not be fair, because the latter covered a network with a variety of lines. The traffic density of the electrified Swiss lines at the end of 1927 was only 60 per cent of the Vienna-Salzburg route, reckoning 20 per cent increase in the 1926 business of the latter.

Moreover, the Swiss lines were electrified during the highly expensive period of the war and just after. The same work would be cheaper today.

The minority suggestion of modernizing the steam equipment was so unlikely of fulfillment that no comment is made on the calculations offered.

The majority holds that the determining factors in electrification, aside from the fuel versus power cost, are the price of capital and the cost of meeting a given traffic density. In general, it paid to electrify busy trunk lines, and it did not pay to electrify lines of weak traffic. This explained the break in the Swiss and Swedish electrification program after the main-line work had been done.

Austria really was only at the start of electrification. Even so, only the following sections were under consideration:

Vienna-Salzburg
Wels-Passau
Vienna-Strass-Sommerein
Vienna-Graz
Bruck-an-der-Mur-Klagenfurt-Villach

This totaled 900 km. (558 miles) or 30 per cent of the trunk line mileage. A decade had been required to electrify the 526 km. (327 miles) west of Salzburg and the 107 km. (66 miles) Salzkammergut area. The 558 miles suggested would therefore be likely to require fifteen to twenty years at the same rate of progress.

In view of the need for taking a perspective view, current financing and fuel conditions should not delay the electrification of the Salzburg-Vienna section.

Hungary had already decided to electrify its trunk lines, beginning with the section between Budapest and the Austrian border at Strass-Sommerein. This would certainly spur electrification of the Austrian trunk line east of Vienna. Mid-Europe would then have an all-electric operation of 1,400 km. (992 miles).

It is finally declared that electrification means a great increase in the value of property, and this will produce more revenue from taxes. This would also relieve the government from paying a considerable amount in unemployment doles. Such benefits justify following the lead of Switzerland, which had promoted electrification with the aid of a subsidy.

Indirect Disadvantages of Electricity Forbid Electrification, Says Minority

The minority report asserts that the disadvantages of electricity outweigh the advantages. Therefore, the estimated excess cost of electrification remains unaltered. While repeating the allegation that smoke-consuming devices are available, the minority admits that electrification is generally regarded as modernization and that the traveling public demands it.

If the non-electrified sections were supplied with 183 new instead of transferred locomotives, 11 per cent fuel or 1,200,000 schillings (168,000) would be saved in a year.

They also asserted that the 30 per cent higher speed of electric operation would increase brakeshoe costs 50 per cent or 75,000 schillings ($10,500) a year. In Austria, the cost of money was very high while coal was particularly low.

Swiss figures for 1927 did show a saving of 1,750,000 francs ($337,750) for electrification, but this was based on a 5½ per cent cost of capital, not 7.3 to 8.26 per cent. Furthermore, the Swiss coal figure was 38 francs ($7.33) per metric ton of 7,500 calories, while the Austrian figure was 23.86 schillings ($3.34) for ton of 4,300 calories.

Traffic density per kilometer was 5,500,000 gross ton-kilometer compared with 9,200,000 gross ton-kilometer on the Salzburg-Vienna division.

The minority said that endorsement of electrification would no doubt be more agreeable to the public and perhaps to the government, but it could not be recommended from the economic viewpoint.

Excluding Switzerland, whose 60 per cent electrification was due to total absence of coal, Austria was well ahead in proportion of electrified track as shown by the following tabulation for conditions in 1927:

	Per Cent		Per Cent
England	2.1	Italy	6.6
Germany	2.2	Sweden	7.5
France	2.3	Austria	8.7

On conclusion of the electrification eastward to Salzburg in 1929, Austria's ratio of electrification would be 12 per cent.

Full-Time Man Substitutes for Safety Committees

ON THE system of the Northern Ohio Traction & Light Company, a departure has been made from the usual plan of safety committees. The latter was followed for a year, but was abandoned in favor of a full-time safety superintendent, known as superintendent of accident prevention, with safety committees making investigations on special days and submitting reports. This plan has been found more efficient.

To maintain interest among the employees, the company has an honor roll with emblems which are presented to employees operating without accidents for periods of one, two and three years. These honor rolls are posted at division headquarters and the emblems are presented annually to the winners by the general manager of the company.

The left-hand or northbound track was raised 14 in. to eliminate double bump in highway crossing

North Shore Line Builds Model Grade Crossing

RECENTLY the Chicago, North Shore & Milwaukee Railroad completed a double-grade crossing over the tracks at Kinzie Avenue and Osborne Road, Racine, Wis., transforming a former "rough spot" into a safe and satisfactory rail-highway junction. To eliminate the double bump caused by the banking of the two tracks for the same-level curve, the northbound track was raised 14 in., starting 400 ft. north of Osborne Road and continuing to a point 250 ft., south of Kinzie Avenue. The vertical curve on the surface of the crossing with the crest just east of the tracks created by the new work is so gradual as not to be noticed. Creosoted planks, 4 in. thick, were spiked to the track ties and surfaced with 2 in. of elastite. New concrete and asphalt paving extending 28 ft. to the east and 4 ft. to the west of the tracks was laid on the crossing approaches. This was the only part of the job not handled by the North Shore Line's own maintenance forces. With the permission of city officials a drainage system installed to carry off all surface water was connected with the municipal sewer and three drains placed along the right-of-way. Estimated cost of the whole job of crossing reconstruction is placed at $6,000.

Looking east in Kinzie Avenue, Racine, across revamped rail-highway crossing of North Shore Line

C., H. & D. Railway
Modernizes Power Supply

Automatic substations replace obsolete manually-operated stations, and purchased power is used instead of power generated in the railway's old steam-driven power plant

By H. A. Rose
General Engineering Department, Westinghouse Electric and Manufacturing Company

One of the substations, showing the high-tension equipment and the hood for protecting the air inlet

POWER for traction purposes on the Cincinnati, Hamilton & Dayton Railway formerly was generated in the company's power plant near Hamilton, Ohio, by reciprocating engine-driven generators of obsolete design, at 390 volts, three phase, 25 cycles. This was stepped up by transformers to 33,000 volts for transmission purposes. Naturally, power costs were high, particularly as the load had outgrown the power system. It was found that a substantial saving could be made by scrapping this plant and purchasing 60-cycle energy.

The six old manual substations had 25-cycle, 600-volt, compound-wound synchronous converters, with total capacity of 3,900 kw.

With insufficient feeder copper the average trolley voltage was low. Passenger schedule speeds were at times curtailed and power for freight haulage was insufficient.

In order to determine the proper locations and capacities for substations, a graphic study was made of power demands of each train, from which the heaviest daily loading for each 5-mile section was indicated. An economic study was made to determine the direct-current distribution losses and the average voltage conditions for different substation spacings. The losses were compared with the investment required to finance a new substation of proper rating. With slight modifications, the arrangement best suited to meet the requirements was found to be that given in the map. The total conversion capacity of the new substations is 3,800 kw.

COMPARISON OF OLD AND NEW SYNCHRONOUS CONVERTER SUBSTATIONS OF THE CINCINNATI, HAMILTON & DAYTON RAILWAY

Name of Station	Old Stations		New Stations	
	Units	Total Kw.	Units	Total Kw.
O'Neils	3	900	2	1,000
Miamisburg	1*	300	1	300
Franklin	2	600	1	300
Elk Creek	..	...	1	300
Trenton	2	600	..	...
Coke Otto	..	...	1	500
Lindenwald	3	900	1	500
Pleasant Run	..	...	1	300
College Hill	2	600	2	600

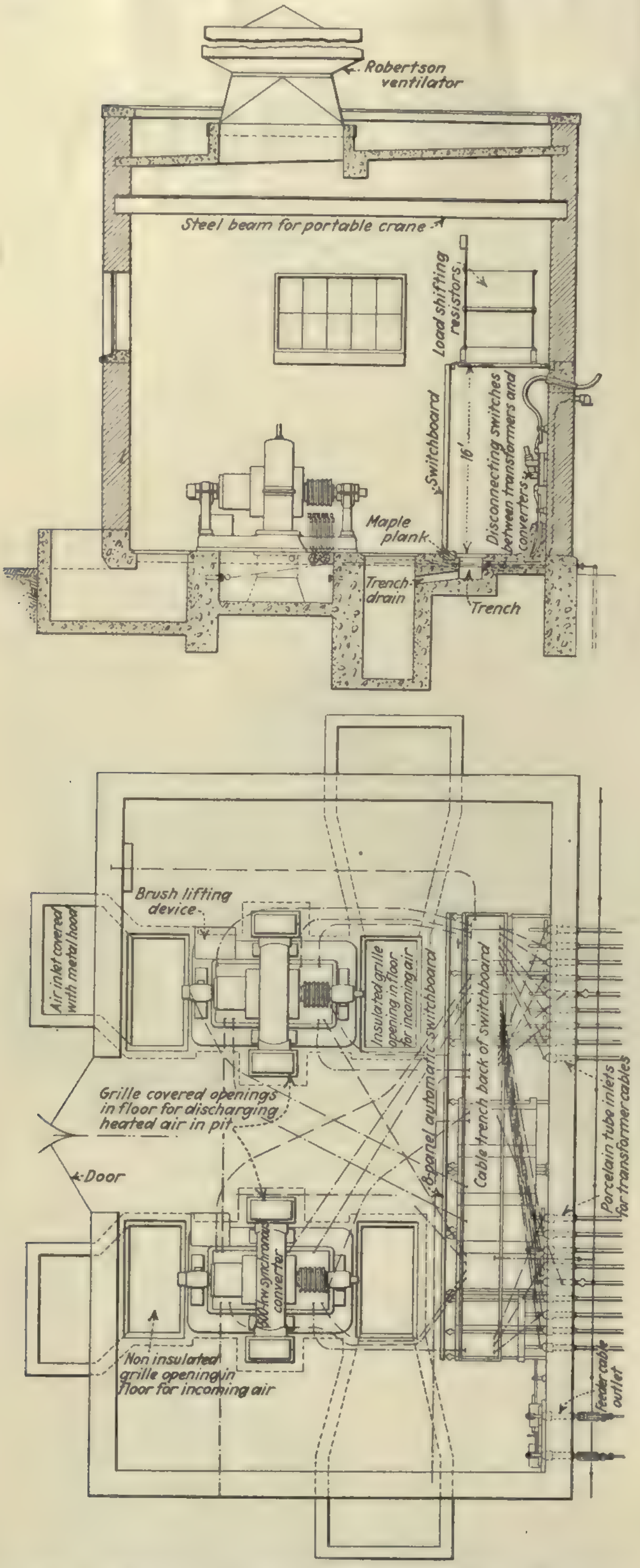
*Portable substation.

The average substation spacing under the new system is 7.64 miles, as compared with 10.7 miles for the old system.

Since the capacity of each substation was determined on the basis of sufficient nominal rating to handle the present maximum load conditions adequate capacity is available for any normal increase in power demand. It follows that any future traffic developments requiring added system capacity would be most economically handled by the addition of substations midway between the existing locations rather than by the installation of a second unit, requiring additional feeder copper. For this reason all except the end stations are of the single-unit type.

Although the methods used for determining substation capacities indicated that a two-unit 1,000 kw. station was required at Hamilton, it was decided to locate a single-unit 500-kw. station on each side of the city.

Although a single-unit substation would ordinarily be sufficient at each end of the line, a station failure would


Robertson ventilator
Steel beam for portable crane
Load shifting resistors
Switchboard
16'
Disconnecting switches between transformers and converters
Maple plank
Trench drain
Trench
Brush lifting device
Air inlet covered with metal hood
Insulated grille opening in floor for incoming air
2 panel automatic switchboard
Cable trench back of switchboard
Porcelain tube inlets for transformer cables
Grille covered openings in floor for discharging heated air in pit
Door
500-kw. synchronous converter
Non insulated grille opening in floor for incoming air
Feeder cable outlet

Plan and elevation of O'Neil's substation, showing ventilating system and arrangement of power ducts

cripple service, since the power required would be fed stub end from the adjacent station. Also, the growing passenger business near Dayton and a particular freight haulage situation near College Hill made advisable the addition of a second unit. O'Neils and College Hill are the only two-unit substations on the property. The O'Neils substation near Dayton has two 500-kw. synchronous converters, while the College Hill substation near Cincinnati has two 300 kw. machines.

New buildings were constructed for all the substations except College Hill, which was remodeled, incorporating the same essential design features used in the others. The structures, which are of red tapestry brick, are well proportioned and pleasing in appearance. The interior dimensions for the 300 and 500-kw. single-unit substations are the same. The following table gives the dimensions for the various types.

STATION INTERIOR DIMENSIONS

Station Capacity	Floor Space, Ft.	Height, Ft
Two-unit 500 kw.	17½x28	16
Two-unit 300 kw. (remodeled)	21 x30	25
Single-unit 500 kw.	17 x16½	16
Single-unit 300 kw.	17 x16½	16

Air for ventilation enters inlets on adjacent sides of the building, is carried downward under the foundation and floor, and enters the interior through a grille-covered opening at each end of the converter bedplate. After passing over each bearing into the armature and field windings it is discharged radially on each side of the field frame. A single Robertson type ventilator in the roof, in line with the pressure belt built up by rotation of the armature, discharges the heated air. For the single-unit substations the ventilator is placed to one side of the converter in line with the direction of rotation. This assures efficient ventilation and at the same time prevents leakage of water on the machine.

Recirculation of air through the machine is reduced by small scavenging ducts which maintain a constant flow of air from the pit to small openings in the floor on each side of the field frame.

A hood covers each inlet at the entrance to the air ducts to prevent the entrance of rain and snow. The ducts are of large cross-section to insure low air velocities, thus aiding in the precipitation of entrained materials. A certain amount of moisture, snow or dirt, which may enter on windy days, is in this way deposited before entering the substation.

One of the illustrations shows the method of terminating a number of large conduits in the pit. All conduits leading to the machine terminate here instead of passing through the floor near the bedplate. This arrangement facilitates cleaning and adds to the appearance of the substation interior.

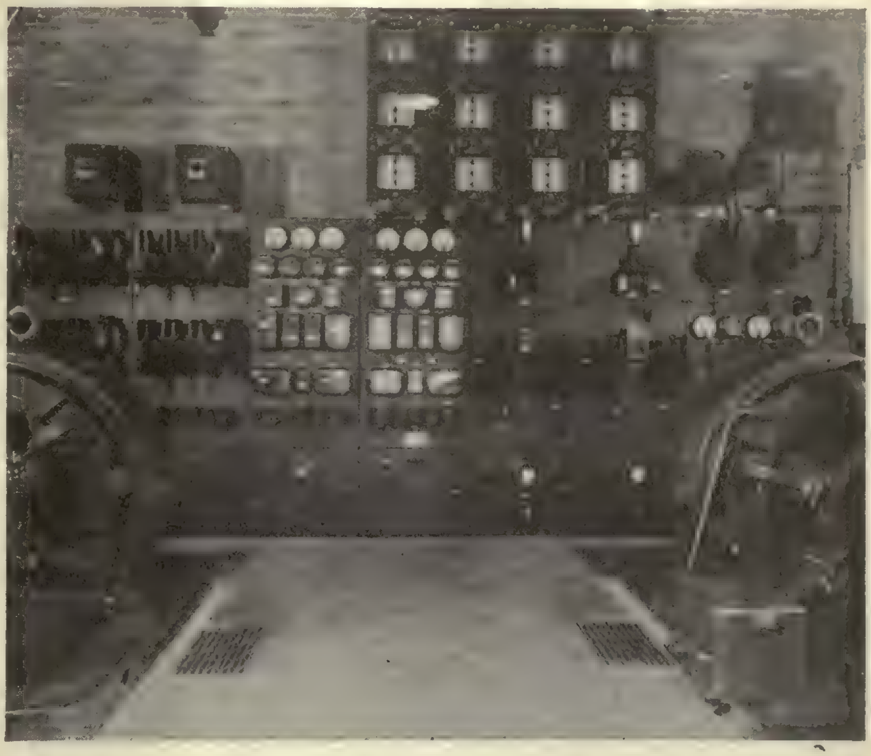
A trench in the floor at the rear of the switchboard terminates the control and power cables between the machine and transformers. This provides a junction or pull box, which aids in the installation and inspection of the cables.

Power is supplied to the railway's 33-kv. high-tension lines from the Union Gas & Electric Company's Hamilton substation. The high-tension lines are sectionalized at this point, one section feeding the substations located north, and the other those south.

Manually-operated high-tension pole-top switches near each station make it possible to sectionalize at any of these in case of a high-tension line fault.

Inexpensive steel structures are used for mounting the high-tension switching and protective equipment and for making taps to the power line. The high-tension equipment consists of three-phase lightning arresters, three-pole gang-operated disconnecting switches, choke coils and expulsion-type fuses. High-tension oil circuit breakers are not used, since the light-load losses of the transformers are not sufficient to justify them.

Shunt-wound synchronous converters connected to



The switchboard and a partial view of the two converters in the O'Neil's substation

low-reactance three-phase transformers convert the 33-kv. three-phase power to 600 volts direct current. The many advantages to be obtained through the use of the shunt machine were responsible for its adoption.

The shunt converter with transformers of 7 per cent reactance gives a direct-current voltage regulation of approximately 5 per cent. The effect of this characteristic is to cause a shift in part of the load to adjacent substations, thus automatically providing for greater conversion equipment capacity at times of heavy loads. In automatic substations, resistance must be inserted between the machine and the bus when the load builds up to a value sufficient to endanger the machine. By lowering the bus voltage in proportion to the load, part of the load is shifted to the adjacent substations. Experience has shown that with compound-wound machines, two such steps of load-shifting resistance are desirable. With shunt machines, one step is all that is necessary.

The use of shunt or drooping voltage characteristic makes possible savings in the car resistor losses incident to the acceleration of heavy interurban or freight trains. This saving obtains through the lesser time required by the motorman to reach the series or full parallel combinations.

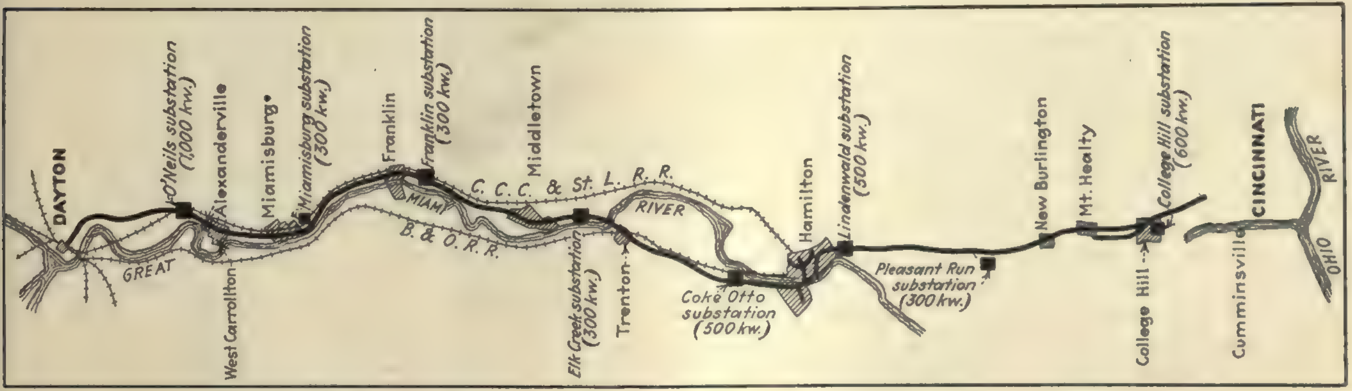
The shunt converter operates at leading power factors above 95 per cent between one-third and full load. From full load to 1½ load the power factor is slightly lagging, being approximately 99 per cent for the higher value. With compound machines and the high reactance transformers required, the deviation from unity is much more pronounced, being approximately 85 per cent lag for one-third load and 97.5 per cent lead for 1½ load. Since the load factor of the railway's substations is necessarily low, it follows that the leading power factor, obtained at light loads through the use of shunt converters, is advantageous.

The kilovolt-ampere rating of the transformers is equal to the nominal kilowatt rating of the synchronous converters. A spare 500-kva. transformer is available in the event of failure of any of those in service. Each transformer has a 10-kva. single-phase, 440/110-volt tertiary control winding.

The substations are arranged for both full and semi-automatic operation and are unattended except for periodic inspections. Full automatic operation provides for starting and stopping of the station in response to load, and stopping if faults develop which might prove detrimental in case of continued operation. Troubles of a serious or permanent nature lock the equipment out of service, and an inspector must restart the station. Troubles of a minor or less permanent nature allow the station to be placed back in service as soon as normal conditions are resumed, providing the load is such as to demand additional machine capacity.

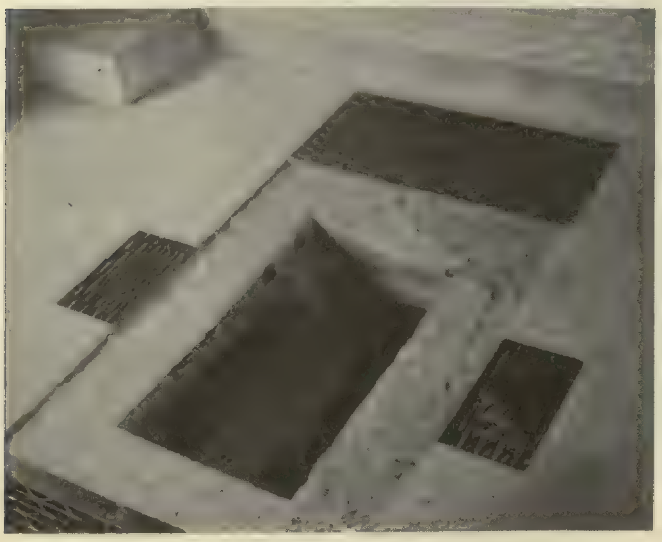
Under semi-automatic operation the station runs continuously until shut down manually or by the functioning of a protective device which either locks or holds the equipment out of service, depending on the nature of the fault. For troubles of a minor or less permanent nature, the equipment in semi-automatic operation functions to hold the unit out only during the fault period, it being returned to service as soon as conditions become normal.

The change from full to semi-automatic operation is made by a double-throw knife switch. It is customary practice to retain at least one station under continuous


DAYTON
O'Neils substation (1,000 kw.)
Alexanderville
Miamisburg
Miamisburg substation (300 kw.)
Franklin
Franklin substation (300 kw.)
Middletown
C. C. C. & St. L. R. R.
MIAMI
RIVER
B. & O. R. R.
GREAT
West Carrollton
Elk Creek substation (300 kw.)
Trenton
Coke Otto substation (500 kw.)
Hamilton
Lindenwald substation (500 kw.)
Pleasant Run substation (300 kw.)
New Burlington
Mt. Healty
College Hill substation (600 kw.)
College Hill
Cumminsville
CINCINNATI
OHIO
RIVER

Eight substations now supply power to the Cincinnati, Hamilton & Dayton Railway system or semi-automatic operation as the master station. The others then stop and start in response to load in their immediate vicinities.

In order to sectionalize the feeder system and to protect the machines from damage due to short circuits between the trolley and rail, two automatic short-circuit detecting, service-restoring, contactor-type breakers are installed at each substation. An insulator in the trolley circuit in front of the stations sectionalizes this circuit. Power is thus fed each way from the stations through a single feeder.



Converter pit and air inlet construction

In event of a short circuit on one section of track, the short-circuit detecting feeder equipments, which supply this section from adjacent stations, open. This removes the faulty section of line while service is allowed to continue on the normal sections. Following the opening of a feeder contactor, a resistor, which is permanently connected across the main contacts, feeds a small current into the circuit presumably at fault. A sensitive relay, connected in such a manner as to measure the resistance of this circuit, automatically recloses the contactor as soon as the circuit resistance has risen sufficiently to indicate that the fault has been removed.

For convenience of inspection and reference, all switchboard devices are marked either by metal plate numbers for devices mounted on the front of the switchboard, or with painted figures for those back of the switchboard. These are in accordance with the latest Power Club device numbers. This indicates the particular purpose for which the device is used. All resistor tubes, fuses, connections and terminal blocks are given wiring numbers. This facilitates inspection and reading of wiring diagrams. It is with the protective device numbers that the annunciator targets of the lockout relay are labeled.

The switchboard and auxiliary equipment are insulated from ground by maple planks in the floor and wall. This arrangement practically eliminates the danger from accidental grounds in the wiring from doing damage.

The electrical equipment for the substations was supplied by the Westinghouse Electric & Manufacturing Company. J. W. Bishop, superintendent of substations for the Detroit Edison System, was consulting engineer, while engineering work in connection with the rehabilitation of the power supply was under the direction of the company's chief engineer, J. E. Dallas.

Milwaukee Devises Test for Substation Operators

SUCCESS in the selection of motormen by means of a standardized test, as worked out by the educational department of the Milwaukee Electric Railway & Light Company, has been so impressive that an investigation into the possibilities of developing a somewhat similar means of forecasting the capabilities of applicants for substation operators' posts was undertaken recently at the urgent request of the electric distribution department of the company. The methods developed in making tests for selection of motormen were discussed in articles in Electric Railway Journal for April 10, 1926, page 624, and Nov. 10, 1928, page 830. Preliminary to any attempt to prepare a selection test a detailed job analysis was made, the task being delegated to a young engineer who started as a station operator and had worked at the various substations of the company for more than 2½ years. This study took a month, and when completed made it possible to specify the necessary qualifications for the position.

The work of the substation operator consists essentially of the following duties: (1) Daily inspection of substation equipment; (2) putting machines on the line; (3) removing machines from the line; (4) testing relay protection, primary and secondary meters, feeder regulators, etc.; (5) cleaning and charging lightning arresters; (6) clearing rotary converters, rectifiers, transformers, and other station equipment of minor troubles; (7) tracing trouble in station wiring; (8) answering telephone and door.

Qualities Necessary for Station Operator

From careful study of the job analysis, visits to a large number of the stations, observation of operations in each, discussion of the work with supervising engineers, and an analysis of types of errors most frequently made by station attendants, the qualities needed by a successful substation operator were summarized: (1) Ability to understand and carry out written directions; (2) ability to understand and carry out oral directions; (3) ability to distribute attention; (4) ability to act quickly; (5) caution; (6) good emotional control; (7) at least average intelligence; (8) good mental control; (9) good memory for numbers and location.

With the above data at hand a group of tests was devised for experimental purposes, consisting of an apparatus designed to measure reaction time, distribution of attention, learning ability, memory, emotional control, freedom and co-ordination of movement. This apparatus as designed and built consists of three parts, a signal and response board, an automatic signal control and recording machine and a tachistoscope. The last is a small box with a cross slot past which five-digit numbers move at approximately five-second intervals. The switchboard contains seven switches of the various types encountered in an ordinary substation. Five of the switches are numbered; the three-pole, double-throw switch is lettered A; the two-pole, double-throw switch is lettered B. Switches A and B provide master control of the five numbered switches. Whenever one of the numbered switches is operated, switch A or switch B must be closed to right or left to complete the desired circuit.

There are three signals, two audible, one visible. These are a horn, a buzzer, two small green lights and a large red one.

The individual under test is supplied with typewritten directions, giving him the sequence which must be followed in acknowledging and shutting off each of these three signals and the emergency red light signal. He is allowed to read and reread these instructions until he believes he understands them and is ready to practice the answering of them at the test board. This study of instructions lasts from three to fifteen minutes, according to how quickly the individual assimilates the printed word, and how thoroughly he feels it is necessary for him to understand directions before trying to carry them out. He then goes to the test board for practice and is given the various signals, to which he responds by manipulation of the switches in definite sequence. He is drilled on these responses until he feels satisfied he can go through all of them without error. This practice period may last from six to twenty minutes, depending on the individual. The instructions relating to the answering of the emergency signal appear on the instruction sheet, but are not unduly emphasized.

The test is commenced with the individual seated at a convenient distance and angle from the test board. He is instructed to copy on a sheet of paper as rapidly and accurately as possible the five-digit numbers which commence to appear in the illuminated slot in the tachistoscope. This work is to be interrupted when signals sound or flash on the board, but is to be resumed as quickly as possible, however, following the answering of the latter. There are 25 signals in all during the test, with two emergency signals. Correctness of responses, errors, and reaction time, as well as the operator's method of handling the switches, are recorded graphically on a tape paralleling the signal sequence tape in the automatic control unit. Reaction time to all signals is measured in hundredths of a second by means of a stop watch which starts and stops with the start and stop of the signals.

The test results of 50 regularly-employed station operators of the company were checked against ratings given the men by two engineers directly responsible for their work and in constant touch with it. Each man was rated with respect to speed in carrying out orders, behavior under emergencies, caution, attention, and mental capacity. The ratings were repeated three separate times at one-month intervals to improve the reliability of the findings. The form used in the ratings is reproduced.

The test board was designed to measure an individual's reaction time, distribution of attention, learning ability, memory, emotional control, freedom and co-ordination of movement

E.M.B.A. Educational Department

RATING OF STATION OPERATORS

Date.................

Name ....Location.........Date Employed.......

Check one item, under each heading, which best describes the above station operator.

SPEED IN CARRYING OUT ORDERS

—Very rapid.
—Rapid.
—Fair.
—Slow.
—Very slow.

CAUTION

—Very careful even to minor details.
—Usually careful, occasionally slips on minor matters.
—Occasionally cautioned.
—Careless, often cautioned.
—Reckless.

MENTAL ABILITY

—Superior intelligence. Thinks things out for himself.
—Good. Quickly grasps directions.
—Average. Follows orders, but needs specific instruction.
—Fair. Needs considerable supervision. Difficult to teach.
—Poor. Untrainable.

BEHAVIOR UNDER EMERGENCY CONDITIONS

—Excellent control under difficult conditions.
—Good control—never loses his head, but noticeably disturbed.
—Upset under unusual conditions, but sufficient control to regain composure quickly to carry out instructions.
—Rather easily upset. Becomes confused but can carry out direct instruction.
—Nervous, very easily confused, cannot be depended upon.

ATTENTION

—Always alert and on the job. Puts self into job.
—Attentive. Carefully watches job. Passively rather than actively.
—Carries out routine but attention is somewhat divided.
—Mind wanders. Often not alert.
—Inattentive, negligent.

....
Rater

This form facilitates rating individual substation operators in Milwaukee

Agreement between the ratings given by the two engineers and that determined from the combination of selection test and accompanying interview, given each of the 50 men tested, has been so close that it has been decided no further experimentation is necessary before utilizing the test as a selective measure. That the investigation has already paid for itself is freely admitted. The test has disclosed one man who was in a serious nervous condition unfitting him for service, and several others were found whose temporary removal from the job for treatment was considered advisable. Transfers and promotions have already been made on the basis of the selection and interview results. It is expected that the test will prove immensely valuable, not only in the reclassification and treatment of the remaining 50 station operators yet to be checked, but also in the selection of new men.

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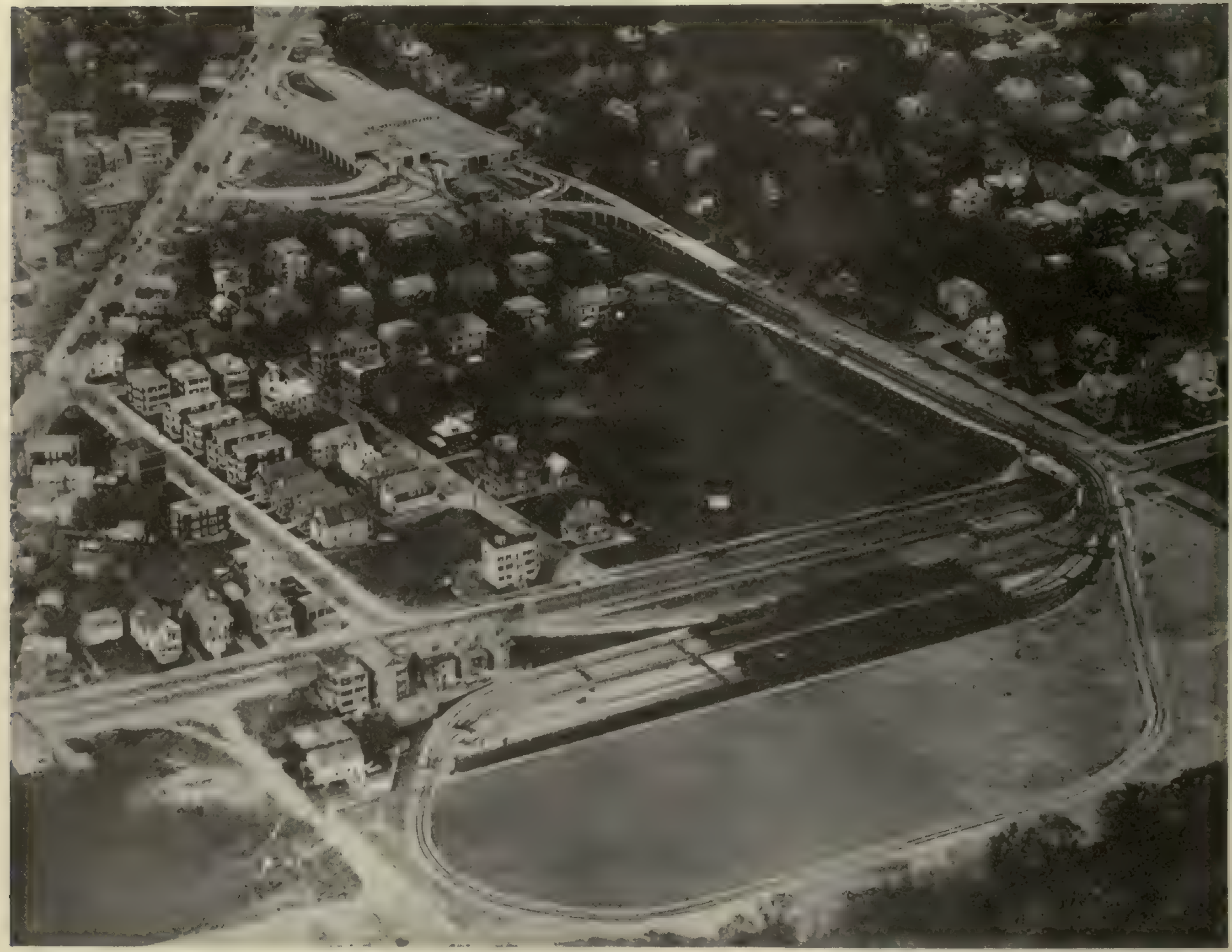
Pullman Car on South Shore Line

ON FEB. 16, the Chicago, South Shore & South Bend Railroad used its first regular Pullman sleeping car, when it carried 35 members of the University of Illinois track team from South Bend, Ind., to Chicago in a special car attached to one of the hourly South Bend limited trains. At the conclusion of the meet, the sixteen-section sleeping car was ready at the terminal for the athletes to retire. It left South Bend at 4 a.m., attached to a Chicago limited train for Roosevelt Road, Chicago. According to officials of the company, this is one of the few instances in which a Pullman sleeper has been used in service on an electric railroad.

Large Car Yard

Designed for Dorchester Extension

Storage space now provided for 60 rapid transit cars. Additional tracks may be installed later. Complete yard signal system facilitates handling of large number of trains which end runs at this point



Aerial view of the terminus of the Dorchester Rapid Transit Extension, showing the Codman Street yard in the foreground and the Ashmont Street station beyond the yard

SOUTH of the Ashmont Station on the Dorchester Rapid Transit Extension of the Boston Elevated Railway is the new Codman Street yard. After trains terminate their runs at this station they continue south, either going to the by-pass track between Ashmont station and the Southern Artery, Codman Street, or continuing over the bridge spanning the Southern Artery to the Codman Street yard. If a train is to go back into service immediately the by-pass track only is used. If it is to be laid up, if additional cars are to be attached to the train, if the length of the train is to be reduced, or if inspection or other work is to be done in connection with it, the train goes to the yard.

The relay track south of Ashmont station is parallel to the two main-line tracks. Between the northbound and southbound track is a raised wooden platform installed for the purpose of allowing the train crew to change ends quickly and to facilitate the cleaning of the train that is to go back into service immediately. It is shown in the bottom illustration on page 364.

All of the switches and signals between Ashmont station and the entrance to the Codman Street yard are controlled from a tower, indicated as *Q* in the accompanying diagram of the yard. This section is well lighted by overhead illumination, and suitable plank walks have been provided so that the trainmen, inspec-

The yardmen's building, at the entrance to the yard, is used by the yardmen of the transportation department, the department of rolling stock and shops, and the trackwalkers, signal men and others of the maintenance department

tors and others can safely and readily walk between the yard and the station.

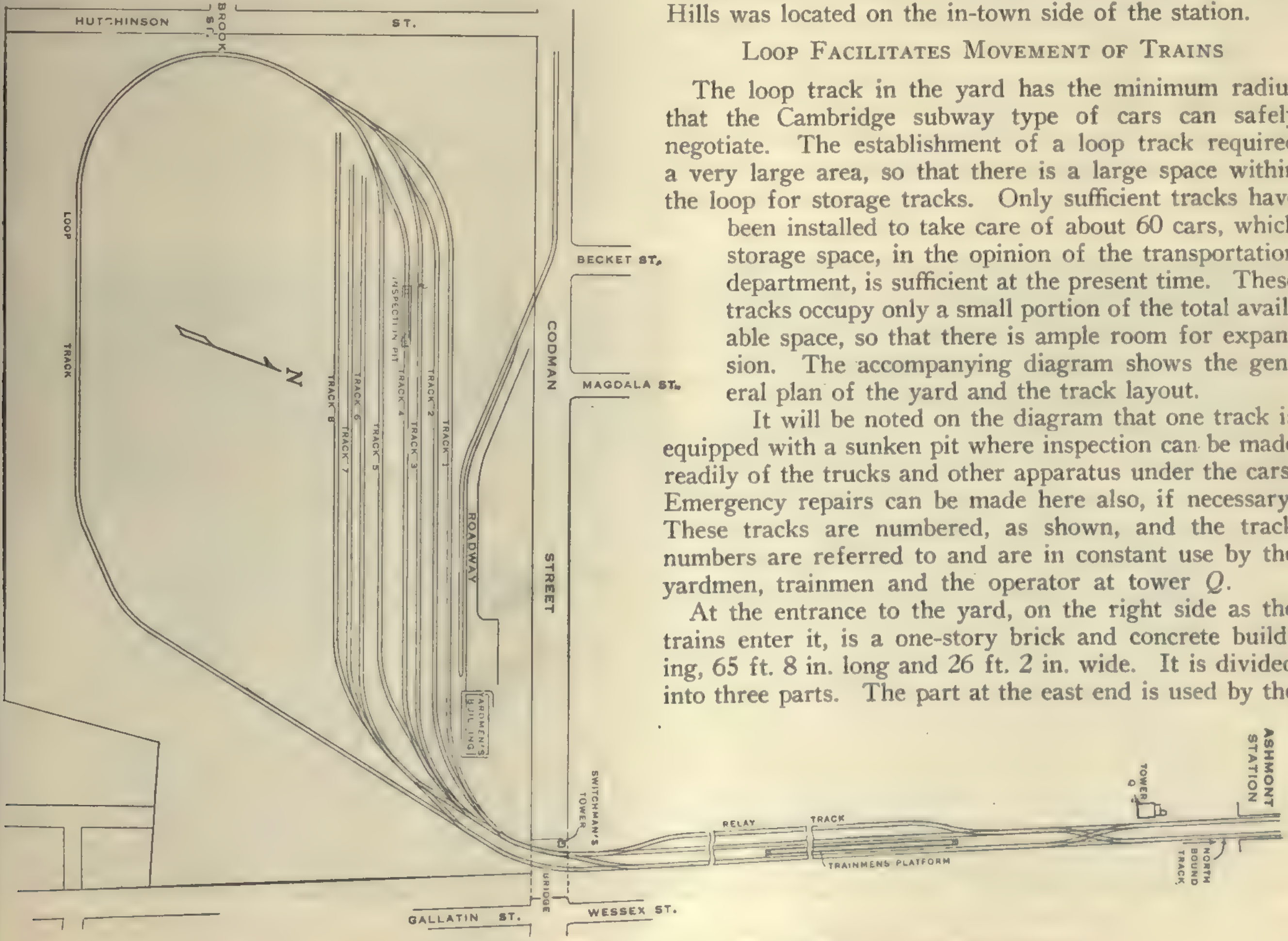
The Codman Street yard is located on a large tract of land containing about 1½ acres, just south of the new Southern Artery and west of the high-speed trolley tracks that will later lead to Mattapan. The yard was located here for three reasons: First, because the area available was sufficient; second, because practically all of the land was already owned by the city of Boston, this area having been used formerly as a stone quarry from which broken stone for the repair of the streets was obtained; third, it was located in the proper position south of, or beyond, the terminal station, which corresponds to the location of all storage yards on the rapid transit lines of the Boston Elevated Railway system. The company has found that for economical and efficient operation of rapid transit trains or cars the yard must be located beyond the terminal station. In recent studies for rapid transit facilities, suggestions have been made that terminal yards be located on the in-town side of the terminal station. The operating and engineering staffs of the Boston Elevated Railway, however, favor the other plan on the basis of actual experience when the yard at Forest Hills was located on the in-town side of the station.

Loop Facilitates Movement of Trains

The loop track in the yard has the minimum radius that the Cambridge subway type of cars can safely negotiate. The establishment of a loop track required a very large area, so that there is a large space within the loop for storage tracks. Only sufficient tracks have been installed to take care of about 60 cars, which storage space, in the opinion of the transportation department, is sufficient at the present time. These tracks occupy only a small portion of the total available space, so that there is ample room for expansion. The accompanying diagram shows the general plan of the yard and the track layout.

It will be noted on the diagram that one track is equipped with a sunken pit where inspection can be made readily of the trucks and other apparatus under the cars. Emergency repairs can be made here also, if necessary. These tracks are numbered, as shown, and the track numbers are referred to and are in constant use by the yardmen, trainmen and the operator at tower *Q*.

At the entrance to the yard, on the right side as the trains enter it, is a one-story brick and concrete building, 65 ft. 8 in. long and 26 ft. 2 in. wide. It is divided into three parts. The part at the east end is used by the



General plan of the Codman Street Yard and the tracks leading to the Ashmont Station

The interlocking tower of the complete yard signal system installed is shown at the right of this view

yardmen of the transportation department; the middle section is used by the department of rolling stock and shops, which will keep here certain material and tools for inspecting and making repairs to cars; and the west portion has been turned over to the maintenance department for the use of trackwalkers, signal men and others. The maintenance section will be used in winter for the use of additional men sent to the yard to remove snow and keep the switches open during snowstorms. The building is equipped with ample toilets and washing facilities. It is heated by steam, the heating plant being located in the basement at the west end.

From Dorchester Avenue to the Codman Street yard, a track has been installed in the center of the Southern Artery, leading into the yard, parallel to track No. 1, and terminating near the yardmen's building. Alongside this track is a driveway which is used for hauling material to, or taking it away from, the yard or the yardmen's building.

There is a system of inter-communication connecting tower *Q*, the yardmen's building and a small switchman's booth located near the Southern Artery Bridge. This is complete in every detail, the three locations being connected with both main line and inter-communicating telephones, call bells and a special annunciator system. The bell signals are used by the towerman in calling upon the yard force to put a relay train into road service, in notifying them when a road train is to be removed from service, etc. The annunciator is used by the yardmen to notify the towerman of required routes to be set up for train movements through the interlocking. Telephones are, of course, for securing and transmitting a variety of information, where greater detail is necessary than can be given by bell code or annunciators.

Looking north from the yard. The track at the extreme left is the relay track, used for trains which are to go back into service immediately. Note the wooden platforms for the trainmen and trackwalkers

The annunciator in use was especially designed. It consists of push-button controls and miniature lights at both the yard building and switchman's booth, and with miniature indicating lights, cancelling buttons and buzzer at tower *Q*. In calling for a route to be set up, the

Looking south from Ashmont Station, showing the Codman Street yard in the background. The platform, shown in the center of this view, allows the trainmen to change ends quickly and facilitates the cleaning of cars yardman pushes the button at either the yardmen's building or the switchman's booth. This call is indicated at tower *Q* by both the light and audible signal. The corresponding light is also displayed at the originating point and continues to show until the route has been set and train movement made, after which it is cancelled by the towerman. By this method, accuracy on the part of both men is required. As both men have the indication of what was called for, disputes are avoided.

New Englanders Express Faith in Rail Transportation

Discussion at Providence meeting centered on problem of making transportation salable and importance of modern cars

THAT the electric railway is certain to be a permanent form of transportation and that steps should be taken to improve the equipment and make it more attractive to the public were the opinions advanced by members of the New England Street Railway Club who met at the Narragansett Hotel, Providence, R. I., on Feb. 21. The sessions were presided over by Walter C. Slade, president of the club and vice-president United Electric Railways, Providence, R. I.

The afternoon session was devoted entirely to the presentation and discussion of a paper by Henry S. Day, superintendent of equipment United Electric Railways, on the subject of modern electric cars for city service. Mr. Day pointed out that it is the job of the railway to hold the present patrons by giving good service and, as congestion increases, to sell the transportation product to as many automobile drivers as possible. "To hold the present riders," he said, "we must change the appearance and riding qualities of our trolley cars because the present-day rider is thinking in terms of the automobile." He discussed the newer types of cars that have been introduced and then concentrated on the present types of standard cars and what could be done to improve them. Mr. Day spoke of the desirability of reducing the weight of railway cars and pointed out that with aluminum it is possible to reduce the weight very materially without sacrificing durability or strength.

Mr. Day then reported the results of an extensive investigation that he and Mr. Webber of his company have made of the use of the lighter metal in cars. A tentative set of specifications for the construction of a car with body and trucks of aluminum has been prepared, the car being essentially a duplicate of the present lightweight cars in service in Providence. The standard steel car with a quadruple equipment of 35-hp. motors and K-control weighs 31,500 lb., according to Mr. Day. The same car, made of aluminum with leather upholstered seats and linoleum covered floors, equipped with four 25-hp. motors and K-control, he said, weighs approximately 23,000 lb. He stated further that stress diagrams indicate that the aluminum car is as strong as the steel car, and it does not appear that the maintenance of aluminum would differ materially from that of steel.

He also pointed out that the use of aluminum would allow the installation of heavier seats and flooring, thereby increasing riding comfort and decreasing noise, due to the changes in the floor construction. At the same time the total weight would be decreased by some 8,500 lb. which would result in a lower power consumption and lower cost of maintenance of the equipment.

In discussing Mr. Day's paper, W. J. McKee, president Osgood Bradley Car Company, brought out that 8,500 lb. can be saved in the frame of the car by substituting aluminum, 1,500 lb. in the trimmings and 1,700 lb. in the motor, making a total saving of approximately 11,700 lb. on a standard 40- to 44-passenger double-truck car.

A. H. Woollen, representing the Aluminum Company of America, spoke on the maintenance of cars made of aluminum, discussing it from all angles. He emphasized that holes and tears in side sheets could be effectively welded, if not too large, and that many parts could be straightened cold and most of them with a little application of heat. As advantages for aluminum in maintenance work, he named the lower total cost of maintenance, the lower cost for paint, the high corrosion resistance of the metal, the high scrap value of aluminum, being 20 to 25 per cent of the original cost, and the lightness of the metal for handling. He mentioned that the same maintenance equipment now installed in the shops could be used for aluminum and that with a little added expenditure for an electric furnace and a two-point pyrometer a shop could be completely equipped for handling the lighter metal.

Others who contributed in the afternoon discussion were Charles S. Johnson, Wason Manufacturing Company, Col. Alonzo R. Williams, United Electric Railways, and A. J. Manson, Westinghouse Electric & Manufacturing Company.

DINNER AND SPEAKING PROGRAM AT EVENING SESSION

At the dinner held in the evening, Col. Alonzo R. Williams presided as toastmaster. The first speaker was Miles B. Lambert, sales manager transportation department, Westinghouse Electric & Manufacturing Company, who spoke on transportation problems and opportunities. He named five big problems with which the industry is now confronted: Traffic congestion, rate making, modernizing equipment, railway income and undermanning. He pointed out that opportunities exist for doing real service in solving many of the problems. "Although the electric railway industry is a basic one it is not thriving as the other utilities are," he stated, "and the railways should study their problems more intensively and consult outside help." Speaking of the traffic problem, Mr. Lambert suggested that the transportation companies take the lead in calling in outside help in studying the city problems and that they use their own organization, in public relations work, to gather facts and present them to the city officials. To solve the rate problem he suggested that the railways make a scientific study of the many factors that affect rates, rather than to continue with the usual cut-and-try method. Speaking on the modernization of equipment, he mentioned that car manufacturers have spent enormous sums to develop new cars, but that the operators were still hesitating in buying them. He mentioned that this delay possibly was due to a lack of confidence and suggested that a committee be appointed to study the car problem and to make definite recommendations.

"Weathering the Storm" was the subject of a lively paper by William B. Spencer, executive assistant to the vice-president and general manager United Electric Railways. Mr. Spencer answered the question "Have We

Faith in the Trolley Car?" very emphatically in the affirmative. He referred to the trying period through which the trolley car has come and chided the would-be obituary writers of the electric railway industry. To use his own words, "As the storms of attempted competition, huge increased costs and gigantic economic obstacles rage on, the good old trolley car still remains, faithfully serving the community, virtually as its throbbing heart—its pulse of existence—a tribute to the courage, stamina and efficiency of the red-blooded street railway men who strive to carry on."

Mr. Spencer spoke at some length on the present-day traffic problem and urged that a thorough analysis be made of all vehicles using the streets to determine which are essential and which are non-essential. "It will easily be determined," he stated, "that the street car is the most economical in the use of street space, costs relatively nothing for the city to supervise, owing to its fixed location, and does bring to the central business district much of its money and is, therefore, responsible in a great degree for the city's prosperity. Common sense solving of the parking problem," he continued, "will do much to silence the unfair criticisms hurled at the street car as a means of blocking traffic and to establish clearly its priceless value to the community. The ballyhoo about street cars causing congestion must disappear."

Mr. Spencer also spoke of the place of the bus in the electric railway industry and outlined his company's policies with regard to the use of this vehicle. He also touched on other important factors that require attention, including a guaranteed seat service, faster speeds and public relations work. He spoke of the necessity of educating the public of the place of the street car in present-day transportation and pointed out that the attitude of the public actually is changing. In conclusion, he said, "The poor, much-abused street car has weathered the storms and is increasing in favor again every day."

The evening program was concluded by a highly interesting, instructive lecture and demonstration on "Making Light Audible," by John B. Taylor, consulting engineer General Electric Company.

Reducing Accidents by Organization

Trainmen on Capital Traction System in Washington hold meetings monthly to discuss best methods to promote safety work. Competition is encouraged for best records

According to the belief of the Capital Traction Company, one of the best ways to interest and educate trainmen in the reduction of street accidents is to gather them together frequently, present accident statistics to them, show how accidents can be prevented and get them to tell each other of their experiences and to make suggestions for improvements that may occur to them. This point is brought out in the brief submitted in the Anthony N. Brady safety contest.

Safety conferences are held monthly at each of the five divisions of the company, with usually three in one day, so timed as to reach as many men as possible. The topics are selected to be of a practical nature. Recent topics include the following: "Collisions—where and how they occur," "Passenger accidents—how they happen and what they cost," "Safety devices and their limitations," "Safety means—their purpose and value," "A typical hearing on a collision."

No matter how well the times for these meetings may be arranged, they cannot reach more than half of the total number of men on the division, so other ways are employed to get the information to them. One is to make a hundred or more copies of the talk and distribute them among those not present. Another is to leave the charts at places where they can be explained by the superintendent or others who have attended. A third is to arrange personal interviews with those men who were not in attendance. Still another and perhaps the best way, in the opinion of the company, is to print a digest of the talk in the company publication, so that every trainman may get a copy.

Divisions Divided Into Groups of Ten

The method of organizing the safety teams is to divide the men of each division into crews of about ten car or coach operators each. The men in each division select a suitable number of men for captains, and they choose their teams from men in the division so that everyone is included. Score sheets are then prepared on which the names of these members appear with the daily total of points scored by each team. The basis of monthly comparison is 100,000 car-miles, with two points for accidents or complaints and ten points for each unreported accident. The company gives to each man at the end of each month a mimeographed sheet with the scores of all the teams, comment on the month's performance, a review of matters discussed at the previous safety conference and such general safety suggestions as will help to interest the men in the safety program.

In addition, since July 1, 1927, record cards have been kept for each individual trainman, and show all accidents with which he has been concerned during the year. On the top of each card removable green tabs were so placed to indicate by position the number of accidents recorded on the card. The records on file of each division were then put in the hands of the superintendent of that division and the men were advised to study their records and note the location of their tab on the card compared with those on the other cards.

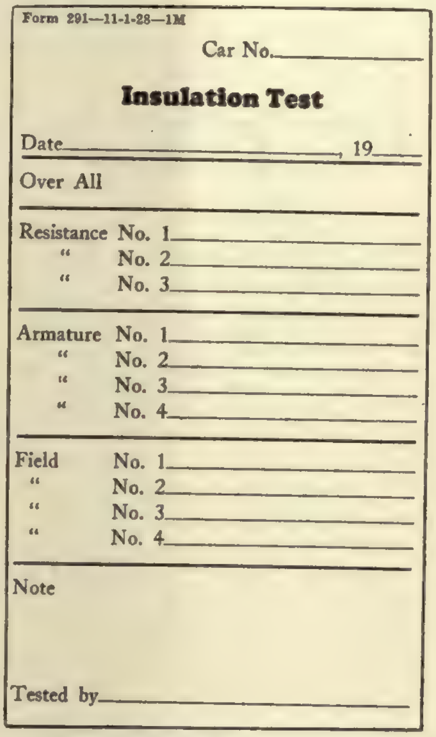
To maintain keen rivalry between the divisions, President Hanna offered a neat safety banner to be awarded each month to the division (cars only) having the best safety record per 1,000 car-miles operated. Although this banner has twice been won by the Seventh Street division, the margin was narrow and the interest aroused in all divisions has been very helpful in keeping the idea of safety permanently in the minds of the trainmen.

To enable the various safety captains to get acquainted with each other and with the officials of the company, monthly meetings are held in the assembly room of one of the carhouses, and two men from each safety team are invited to attend. Thus, in the course of ten months all of the trainmen have an opportunity to meet the company officials. Through these meetings the company officials are kept in closer touch with the safety work, the men have another point of contact with the safety campaign, they are encouraged to express themselves, and every month they have another helpful topic for discussion with their fellow workmen.

Practical Ideas *for the* Maintenance Man

Testing Insulation to Prevent Equipment Failures

INSULATION tests are now made at regular intervals on cars of the Des Moines City Railway, Des Moines, Iowa. The company operates cars from two carhouses, the larger one with approximately 100, and the smaller one with about 40. Test instruments are installed only in the larger carhouse, and cars from the smaller car division are tested as they come to the general shop for maintenance repairs. The equipment used in making these tests includes a Weston 600-volt direct-current voltmeter of 80,000 ohms internal resistance. This has been calibrated to read in megohms so that the insulation values are read directly for the electrical circuits. The procedure used in making routine insulation tests consists of placing a piece of fiber under the ground finger of the K-35 controller of four-motor equipments. The circuit breaker on the car is opened and the voltmeter leads are attached across from the trolley to the various controller terminals. If the voltmeter needle registers less than 25 volts on the 600-volt scale a further investigation of car circuits is considered necessary, inasmuch as this reading indicates an insulation resistance of 2 megohms or better. However, if a voltmeter reading of more than 25 volts is obtained; the individual car circuits are checked to locate the one having the low insulation resistance.



Form 291—11-1-28—1M

Car No.__________

Insulation Test

Date__________, 19____

Over All

Resistance No. 1__________
" No. 2__________
" No. 3__________

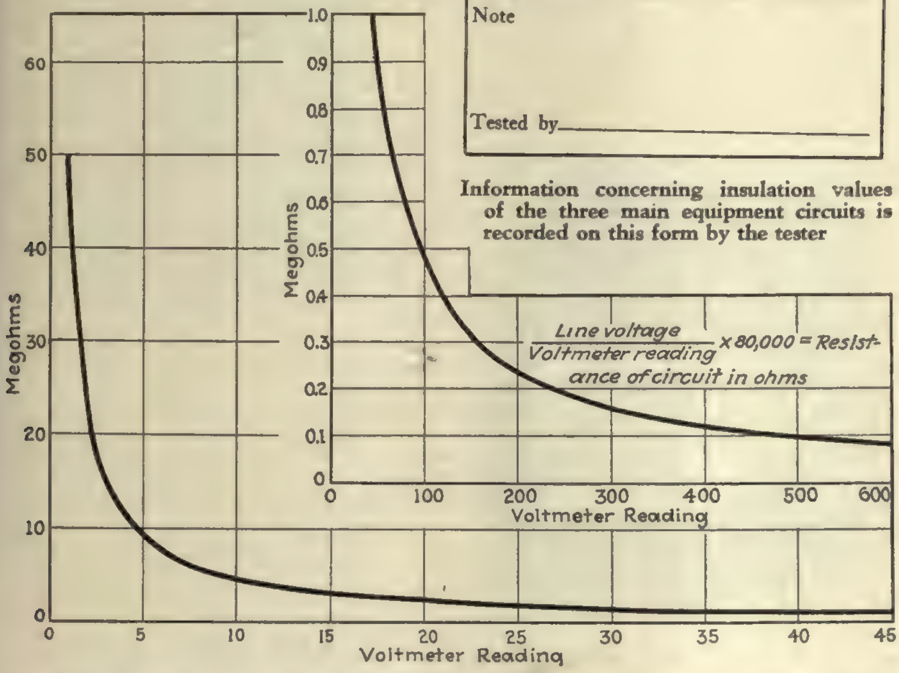
Armature No. 1__________
" No. 2__________
" No. 3__________
" No. 4__________

Field No. 1__________
" No. 2__________
" No. 3__________
" No. 4__________

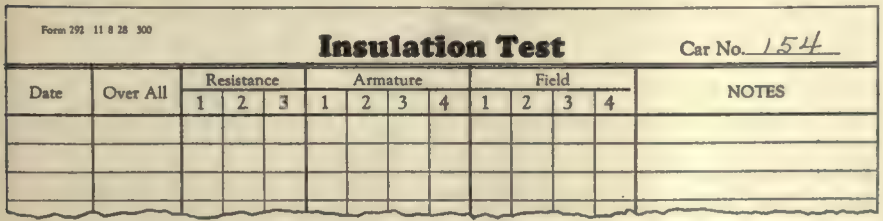
Note

Tested by__________

Information concerning insulation values of the three main equipment circuits is recorded on this form by the tester



Voltmeter readings are translated into megohms by means of the calibration curves shown. The larger of these is simply an expansion of the low scale portion



Form 292 11 8 28 300

Insulation Test

Car No. 154

Date	Over All	Resistance			Armature				Field				NOTES
		1	2	3	1	2	3	4	1	2	3	4	

A complete history of insulation tests and equipment repairs for each car on the system is kept in permanent file form on this card record

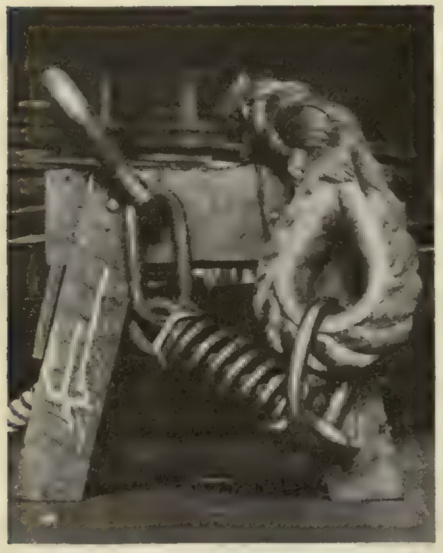
In the varied testing experience of the Des Moines Railway, the trouble is located most frequently in the car resistors, especially if the tests are being made during the wet seasons of the year. Motor fields, armatures and cables also come in for their share of the faults found by the insulation test and many that would cause serious trouble in service are weeded out and so are prevented from giving trouble.

Where segregation of the individual circuits for further tests is necessary, the tester works from the reverse points of the controller to secure readings for each motor, armature and field separately. If the weak point still remains unlocated brushes are lifted from the brush-holders and voltmeter leads are applied directly across the armatures of the motors and fields so as to test each part separately.

So far, 125 cars have been tested by this method. Half of these readings on the voltmeter indicated a condition that required correction. Four armatures with weak insulation were located and repaired. Three of these were repaired by simply redipping and baking.

Tow Rope With Compression Spring

NO MATTER how carefully a fleet of buses is maintained or what precautions are taken to avoid accidents, some will need towing. The Surface Transportation Company, a subsidiary of the Third Avenue Railway, New York, N. Y., experienced towing trouble, due to the breakage of tow lines when the towing machine took up the slack too rapidly. The tow line shown in the accompanying illustration was designed to prevent this destruction. It is a rope 2½ in. in diameter with a 2½x6-in. eye spliced on either end. One eye is fitted with a ring 5 in. in diameter, made of ⅞-in. round iron together with a hook made of 1½-in. material. The other end is provided with a compression spring with the necessary supporting links and a hook. The link fastened to the splicing eye is elliptical in shape and is 6 in. wide at its widest point. It is made of ⅞-in. round iron and is about 7 in. long. The link to which the hook is fastened is made of the same material and has inside dimensions of 2½x7 in. The hook is made from 1½-in. material and has an opening of 2½x5¼ in. The compression spring is 8½ in. long, 4½ in. outside diameter and is made from ¾-in. material. It is designed with seven turns and the spacing between turns is $\frac{9}{16}$ in. The spring seats consists of two ½-in. plates 4½ in. square. They have, on each corner, a spring guide prong ¾ in. long.


This tow rope has been found very useful for moving disabled buses

These plates are designed with four 1$\frac{5}{16}$-in. holes drilled diametrically opposite. Two ⅞-in. U-bolts having an inside diameter of 2¼ in. are passed through the spring and spring supporting plates in opposite directions and the ends riveted to the plates. The spring apparatus is about 16 in. long over the ends of the U-bolts in the full release position. The force of the jerk in taking up the slack of the rope is dissipated in the compressor of the spring, thereby preventing the breaking of the rope.

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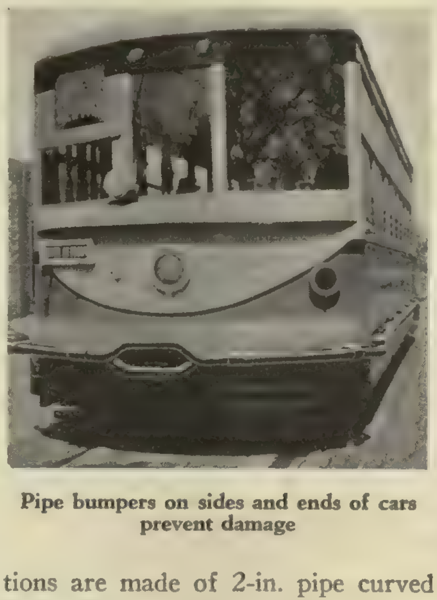
Bumpers for Cars Reduce Collision Damages*

By E. M. Lunda

Superintendent of Shops and Equipment, Grand Rapids Railroad, Grand Rapids, Mich.

TO PREVENT damages to cars from side-swiping and collisions, the cars of the Grand Rapids Railroad are equipped with front and side bumpers. They have been in use over a year, and serious damage has been prevented on several occasions. The side bumpers run the entire length of the car and are constructed of 2-in. steel pipe. This has tapered ends with 1½-in. offset. They are held out from the car sides with four oak blocks. The front bumpers are made in three sections. The end sections are made of 2-in. pipe curved to conform to the channel bumper and spaced 3½ in. from it. The center section is of cast steel and has an opening to permit the draw bar to pass through it. The cast-steel construction is a safety feature for, in case of an accident, it will break and prevent the frame being distorted. The cost of a new center is only $2.


Pipe bumpers on sides and ends of cars prevent damage

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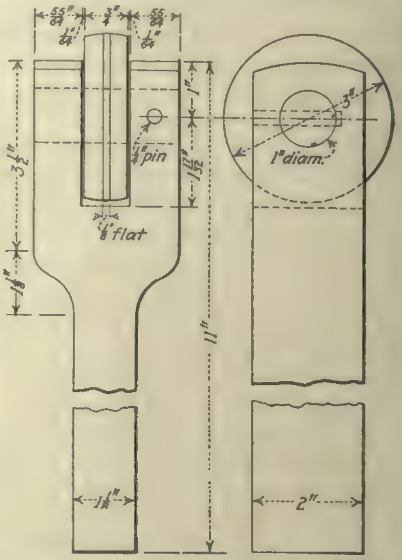
*Submitted in Electric Railway Journal Prize Contest.

Polishing Tool for Journals

EVEN though a bearing is packed properly and the correct grade and quantity of oil is used, operation will be unsatisfactory if the bearing surfaces are not perfect. This will cause an increase in maintenance expense and service interruptions.



This polishing tool has been found to be very efficient

Great care is exercised in the shop of the Staten Island Rapid Transit Railway, Staten Island, N. Y., to see that all bearings are in good condition. Not only must all axle and journal-bearing fits be turned accurately but the fits must be polished highly before they are acceptable for service. This polishing is done by a polishing tool designed and constructed by Machinist James A. Collins.

The tool consists of a hardened steel wheel supported by a steel holder. The wheel is made from tool steel and has a diameter of 3 in. It is ¾ in. thick. The polishing surface is rounded except for ⅛ in. in the center. The wheel is mounted on a 1-in. shaft which is fastened to the jaws by a ¼-in. pin. The holder is made of 2½x2-in. stock and is 11 in. long.

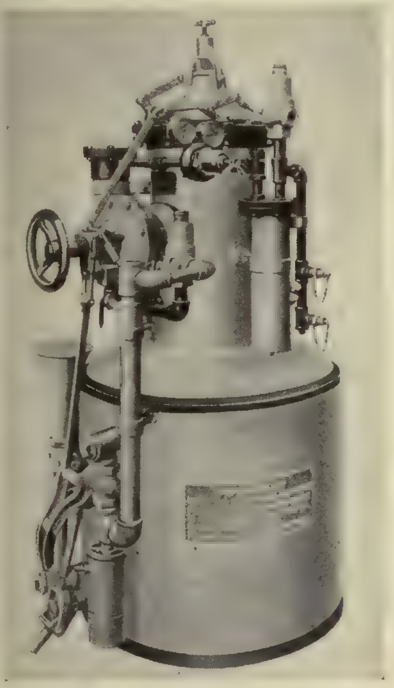
The 2½-in. side is narrowed to 1⅛-in. at a point 3½ in. from the end of the jaw. The axle supports are $\frac{55}{64}$ in. wide, and the wheel slot $\frac{25}{32}$ in., leaving $\frac{1}{64}$-in. clearance on either side of the wheel. This tool is mounted in the lathe tool rest so that the wheel comes in contact with the revolving axle fits. The wheel rolling on the oiled surface of the axle fit produces a highly polished surface which reduces lubricating expense.

New Offerings of

Useful Equipment

Medium Pressure-Type Acetylene Generators

THREE medium pressure-type acetylene generators for welding and cutting have been placed on the market by the Oxweld Acetylene Company, New York, N. Y. The type MP-2 is built in two sizes having 50 and 100 lb. carbide capacity, respectively. The type MP-3 is of 300 lb. capacity.



Improved type of acetylene generator

The type MP-2 generator is similar to a previous design in construction and operation. The feed mechanism has been redesigned to make the carbide shut-off more positive. A new method is used to stop the carbide feed positively, in case the diaphragm breaks or zero pressure exists in the generator due to any other cause. A new regulator, the type R-40, is furnished instead of the line regulator formerly used. This regulator is of the stem type, having a large stem and seat to provide ample capacity, and is equipped with two gages. One of these indicates the pressure in the generator and the other the pressure in the delivery line.

The hydraulic back pressure valve, which has been simplified, and the filter are of seamless steel tubing assembled by bronze-welding and then galvanized. This construction is more sturdy than that previously employed. The vertical pipe, leading downward to the back pressure valve and extending below the surface of the water, is fitted with an angle check valve. In case back pressure is exerted, water will be forced up the vertical pipe causing the check valve to close and preventing the possibility of back pressure or flash reaching the interior of the generator.

The two relief valves, one mounted on the hydraulic back pressure valve and the other directly connected to the generator, are of new design, have larger capacity and are less liable to leak than the older devices. A desirable feature consists of interference levers which unseat the relief valves every time the generator is recharged. This arrangement automatically prevents the relief valves from sticking, should they be called upon to function. Since the relief valve on the hydraulic back pressure valve opens only momentarily, no acetylene from the line is lost during recharging. A conveniently placed clean-out door renders the feed mechanism parts accessible and easy to clean without dismantling the generator.

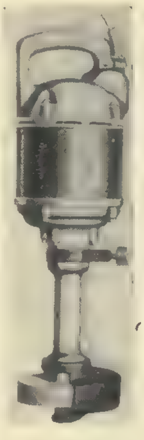
The type MP-3 generator has been placed on the market to meet the demand for a pressure-type generator of large capacity that will supply gas with a minimum pressure fluctuation and with minimum expense for maintenance. The feed is driven by a motor actuated by a weight. A diaphragm pressure control is used in connection with the motor to regulate the feed and maintain proper pressure in the generator. The feed shaft bearing is protected by a dust-proof cover which protects it from carbide dust. Two charging doors facilitate filling the hopper. For maximum durability, some gears are made of bronze and Monel metal and certain shafts are of special alloys. The brake control on the motor is positive in action and does not require frequent adjustment once it is set.

A clean-out door is provided which permits cleaning the carbide feed disk without removing the generator top. The filter can be repacked, if necessary, without breaking any adjustment of interference or relief valves. This operation is performed by removal of the top plate. The hydraulic back pressure valve is arranged so that it is always filled with water before the generator itself is entirely filled. An overflow-level check plug has been provided in order that the operator may check the water level at any time.

The feed motor is rendered inoperative, if zero pressure exists in the generator because of a pronounced leak or any other contingency. The operating pressure can be changed by turning the adjusting nut on the feed control. During normal operation the set pressure will not vary more than about 1 lb. The type MP-3 generator consists essentially of two sections, the lower being a cylindrical shell, the upper a shell in the shape of a truncated cone. The bottom is dished for maximum strength. All seams are bronze welded, both inside and out. The overall height is slightly over 120 in. and the height to the top of the generator shell is 104 in. The diameter of the shell is 42½ in. The shipping weight is 2,300 lb.

◆

Portable Grinder and Buffer



New type of grinder and buffer

CONVENIENCE of control is made possible in a new ½-hp. portable grinder and buffer, announced by the Hisey-Wolf Machine Company, Cincinnati, Ohio, by a two-pole switch located at the grip handle. A specially designed compound wound motor for direct current is provided. The cast steel wheel guard is adjustable and can be placed at an angle most convenient for the operator. The end cover is readily removable and affords quick renewal of grinding wheels, when these become worn out.

News of the Industry

New Rapid Transit Measure for Boston

A new Boston Elevated bill, based on the so-called Harriman $50,000,000 rapid transit extension measure but containing several changes intended to meet objections raised by Mayor Nichols, was placed before the legislative committee on metropolitan affairs on Feb. 25. The new bill seems likely to reopen the entire question and according to the Boston News Bureau additional hearings may be necessary. It was drafted under the direction of Frank S. Deland, corporation counsel for Boston.

Unlike the old bill, two parts of which would have become effective even if stockholders of the road had rejected a third part, the new bill stands or falls in its entirety. The most important change is that while the old bill set up a metropolitan transit council which was a factor in name only the new bill makes this council the all-important agency in carrying out rapid transit extensions provided in the measure.

Another entirely new provision is that every ten years there shall be a readjustment of the proportioning of the cost between the car-rider and the taxpayer. If trustees and members of the council fail to agree, either party may then apply to the Supreme Judicial Court for the appointment of three suitable persons as arbitrators.

The new bill contains a section, to which Mr. Harriman is reported as being strongly opposed, whereby depreciation shall be set aside by trustees only as approved by the State Department of Public Utilities.

◆

Ten-Cent Cash Fare in Columbus

C. C. Slater, general manager Columbus Railway, Power & Light Company, Columbus, Ohio, has notified Columbus Council that cash fare will be 10 cents. Tickets will be 35 cents for five. The fare has been 6 cents or five tickets for 25 cents.

These advances, according to Mr. Slater, will increase the revenue of the railway lines by $1,039,487 a year. Counterbalancing the fare increase, rates for electric current will be cut to 6 cents a kilowatt hour starting March 10. The present rate is 7 cents.

This, Mr. Slater said, would reduce revenues from this source $312,360 a year. Another cut made recently, he said, reduced revenue from sale of current $780,070 a year, making a total reduction of $1,092,430 a year.

Cars have been operated for three years without a franchise. Unless some legal course not apparent on the surface is discovered, it appeared the city can choose between two courses:

Accept the fare increase and open negotiations for a new franchise, making the best possible deal for fares.

Order the cars from the street and make other arrangements for transportation service.

Councilman Worley, a member of the public utilities committee of the Council, said:

> If it is possible for the rail-light company to fix fares to suit itself the company has a great deal more power than it should have, and I am in favor of putting in a complete bus system.

This expression of opinion is, however, regarded as the extreme view. More reasonable counsel is expected to prevail.

◆

One-Man Car Inquiry in Indiana

An investigation to determine whether one-man street cars are less safe than the two-man crew types will be held by the Indiana Public Service Commission. The complaint was made by an Indianapolis resident. James P. Tretton, superintendent, Indianapolis Street Railway, said the experience of the company had been that the one-man type of car was as safe, if not safer, than the two-man type.

◆

Buffalo Report Completed

Experts employed by the Buffalo municipal authorities to make an exhaustive survey of service, operations and costs of the International Railway, Buffalo, within the city, have completed their report which will be used in opposition to the application of the railway company for a 10-cent local fare now pending in United States District Court at Buffalo before Judge John R. Hazel. The corps of experts were under the personal supervision of Col. Harold U. Wallace, former manager of the Detroit Municipal Railway.

The report lays particular stress upon the operation of one-man cars on all local lines of the International Railway. According to it an adequate fare to be charged in Buffalo can be fairly determined only from a consideration of the properties used in the local service contrasted with receipts and expenditures. Interurban and other services, the report says, have no bearing on the proper Buffalo rate.

The reports have been filed with Federal Judge John R. Hazel as part of the city's application for a United States District Court order demanding segregation of the railway company's properties before the suit is brought to trial.

New York's Transit Policy Produces Congestion

Daniel L. Turner, consulting engineer for the New York Transit Commission, told 200 members of the Municipal Art Society of New York, at their annual luncheon recently that only one-third of the metropolitan area was served by rapid transit facilities.

He said the experience of the last 40 years showed that population always followed development of transit facilities, instead of the reverse. He expressed amazement that this principle was not fully understood after almost 100 years of street railway transit.

Mr. Turner said transit facilities must be furnished in advance of population and in the way that it is desired to develop the city. Unless that were done, he said, city planning would be largely futile. He added that despite the large amount of automobile traffic, the transit lines carried 75 per cent of the passengers and were consequently the controlling factor in city development. He is reported to have said:

> New York has not made the best use of its rapid transit facilities. There has been too much concentration of the lines, with consequent overlapping in the service area, particularly in the outlying boroughs. In 1925 new subway and elevated lines increased the net area served only about 41 square miles, through 111 route-miles have been constructed since 1904. One square mile of new area required nearly 3 miles of new rapid transit line. This is an extravagant use of rapid transit facilities.
>
> For this reason and because of the possibility of unlimited land use, the city's rapid transit policy produces congestion instead of relieving it. This results in a vicious circle. The city has been concentrating its new rapid transit lines too much in already overdeveloped areas.
>
> In 1925 there were 210 route-miles of track traversing the city, yet direct and convenient service is afforded to only about 97 square miles. The remaining 202 square miles has no direct facilities accessible to it. After building lines for 55 years, New York even now is serving only about one-third of the entire city area. Eighty-six per cent of the city population is concentrated in the 97 square miles and 14 per cent are spread over 202 square miles, all because population will follow rapid transit and the land can be developed in response to any population demand. The used area of New York City is no larger than Little Rock, Ark,

According to Mr. Turner the distributive influence of transit should be utilized to the utmost in these communities and thereby relieve congestion along rapid transit lines already overcrowded. If rapid transit is not furnished to New York's entire city area, the population cannot be distributed through the city's 200 square miles of unpopulated area.

Terminable Permit Bill Advanced

The judiciary committee of the Missouri House of Representatives on Feb. 22 reported out favorably the terminable permit bill for common carriers, sponsored by the St. Louis Transportation Survey Commission as part of the program for obtaining a rapid transit system in St. Louis. It is the last of four bills sought by the St. Louis commission to be reported out favorably by the House committee. Three of the bills have been engrossed and are now on the calendar for third reading and passage.

Under an amendment suggested by the attorney for the People's Motorbus Company, St. Louis, the permit bill allows street railways, bus lines and other common carriers, operating prior to Jan. 1, 1929, to obtain a terminable permit for an unlimited period subject to cancellation for misuse and non-use without a public hearing on the merits of the application, once the carrier obtains the consent of the municipality affected for the surrender of franchise for the new permit.

◆

Transportation and Engineering Topics on Illinois Program

Six addresses on specialized topics are announced on the tentative program for the railways division of the ninth annual joint convention of the Illinois State Electric, Illinois Electric Railways, and Illinois Gas Associations to be held in Springfield on March 14-15. Joint meetings will be held in the mornings and group meetings of the individual divisions in the afternoons.

Members of the Illinois Electric Railways Association will hear an address, "One-Man Operation in East St. Louis," by G. W. Welsh, vice-president East St. Louis & Suburban Railway, East St. Louis, Ill., after which there will be general discussion.

W. C. Wheeler, engineer of equipment Chicago Surface Lines, will discuss "Late Trends in Car Equipment," and A. W. Baumgarten, Chicago & Joliet Electric Railway, will talk on "Mercury Arc Rectifiers as Applied to Electric Railway Service."

"Co-Ordination of Rail and Bus Service" will be the topic of Emil A. Roehry, general manager St. Louis Electric Terminal Railway. H. O. Crews, supervisor of public relations Chicago Surface Lines, will talk on "Visualizing Transportation Problems." As an added feature "Safe Highways," a film release of the Chicago Surface Lines, will be shown.

◆

Parking—A Serious Menace in Baltimore

An active part is being taken by the United Railways & Electric Company, Baltimore, in an effort to prohibit parking on some of the downtown streets of the city. The movement was started when two fires reached serious proportions because parked automobiles prevented the firemen from getting their apparatus into position for service immediately. An ordinance prohibiting the parking has been introduced in the City Council at the request of the fire department officials and the railway as well as other interests is backing the measure.

◆

Unification in Grand Rapids

Move advanced under which railway, bus and taxi services would be brought together

Another step has been taken toward the consolidation of street railway, bus and taxicab services in Grand Rapids, Mich., under the control of the Grand Rapids Railroad for the purpose of reducing congestion and meeting new demands for additional transportation. Through L. J. DeLamarter, vice-president and general manager, the railway has formally and favorably replied to the recent recommendations of G. J. Wagner, city consulting engineer, that the company be authorized to carry out his suggestions to augment the present rail system with bus and taxicab service.

Mr. DeLamarter says that he realizes the congestion in the downtown districts and that extensions to service must be made in the future, but that increased revenues must be assured or the city government will face a problem of subsidy to maintain mass transportation facilities. He believes, however, that with the continuation of co-operation from the city that has existed, and with protection to the railway as long as the service is rendered satisfactorily, the railway would be justified in investing in a taxicab line and extending its bus systems.

The proposed taxicab service would be created to supplement the regular rail service, as suggested in the Wagner report. Mr. DeLamarter said:

> It is obvious, however, that the interest of the public would be ill served if the proposed special service should be exposed to loss from future ruinous competition from other taxicab companies. This company should be in a position substantially to cover this whole field of transportation or it should not be entered.

When the City Commission adopted the Wagner recommendations in December that body assured the railway a broad policy of operation and if this were carried through there would be no difficulty from more cab companies than exist now. In commenting on this phase of the situation, Mr. DeLamarter's reply states:

> Rights of present operating taxicab companies, of course, should be essentially preserved.

Mr. DeLamarter's reply stated that, if the railway is authorized to operate a taxicab system, it should not be legislated against as to such reasonable maximum or minimum fare as may be required to meet conditons now, unforeseen but that may arise. Peak load services of the railway will be covered well by the additional buses, while heavy capital investments will be required by the new units of bus and taxicab services. Mr. DeLamarter states that he believes both will prove great aids to the present rail system.

In dealing with the tax situation, the reply states that it is recognized throughout the country that having the railways furnish capital for tracks and paving and also requiring them to pay taxes on both track and equipment have militated against their successful operation. Relief from having to invest in pavement between rails is asked by the railway. Since this change can be effected only by charter amendment, the company asked that the question be placed before the voters.

The commission has announced that it will take time to study the general manager's suggestions and recommendations.

◆

Interurban Will Supply Service in Springfield

Organization of an entirely new company to operate street cars and buses in Springfield, Ohio, is contemplated by the Cincinnati, Hamilton & Dayton Railway, which plans to acquire the Springfield Railway.

Should the plan go through, it is intended to have the Springfield Railway permit the new organization to operate cars over a portion of the narrow gage track now used by the city street cars, in addition to giving city service over the standard gage trackage of the Indiana, Columbus & Eastern system within the corporation limits.

These plans were divulged in the reply of Thomas Conway, Jr., president of the interurban line, to a telegram sent him by Springfield officials asking whether the plans of the Cincinnati, Hamilton & Dayton in regard to the local transportation system would necessarily hold up the improvement of E. High Street, proposed to be carried out by this year. Mr. Conway stated that his plans would not interfere with the proposed improvements.

The city of Springfield has advertised for proposals to furnish a transportation system for the city. Among the bidders who have submitted proposals are the Twin Coach Corporation, Kent, Ohio; The City Rapid Transit Lines, Newark, Ohio; Alexander S. Drescher, Brooklyn, N. Y.; and Cincinnati, Hamilton & Dayton Railway.

◆

Reduced Rates for Sacramento School Children

As the result of informal negotiations conducted by the Railroad Commission, the Pacific Gas & Electric Company, which operates the railway lines in Sacramento, will place in effect on March 20, 1929, school children's reduced rate tickets on the basis of eight rides for 25 cents, applying to *bona-fide* school children under 18 years of age, and attending schools of grade no more advanced than the high school. At the present time this privilege is extended only to children of thirteen years or under.

Oldest Aircraft Paper Acquired

Aviation, weekly founded twelve years ago by Major Lester D. Gardner, bought by McGraw-Hill

AVIATION, the oldest aeronautical magazine in the United States, published weekly, has been acquired from the Aviation Publishing Company, New York, by the McGraw-Hill Publishing Company, Inc. Devoted to the field of aviation in all its phases, the weekly was established twelve years ago by Major Lester D. Gardner, until recently president of the Aeronautical Chamber of Commerce and now president of Aeronautical Industries, Inc. Under the new owners, who now publish 25 engineering, industrial and business papers, the field of the publication will continue to include aircraft manufacturers, engine and parts makers, airports, distributors and others who are professionally engaged in aeronautics.

Aviation fits in well with the other papers of the McGraw-Hill group, which covers the five major branches of engineering—civil, electrical, mechanical, mining and chemical. Several of these papers have long been closely concerned with various aspects of the progress of aviation. ELECTRIC RAILWAY JOURNAL and *Bus Transportation* have been recording the development of this new agency of commercial transportation. *American Machinist* and *Factory and Industrial Management* have been encouraging high efficiency in manufacturing production. *Engineering News-Record* has given much attention to the civil engineering problems of airports, runways and structures. *Electrical World* has discussed the lighting of airways and airports, and also signal systems. *Chemical and Metallurgical Engineering* has contributed to the solving of many problems of weight, corrosion and wing surfacing. The *Magazine of Business* recently conducted a year's practical experiment in "Flying for Business," operating its own plane.

James H. McGraw, chairman of the board of the McGraw-Hill Publishing Company, said:

> Aviation is now becoming a vital tool of modern business, and a new basic industry is in process of development. McGraw-Hill desires to contribute to the progress of aviation a publishing service that will provide every facility of modern industrial journalism to aid in the solution of its inherent problems.
>
> We assume the publishing direction of *Aviation* with the conviction that the resources of the McGraw-Hill organization will bring new strength to this paper and practical benefits to the industry beyond the reach of a single publication. We enter this field only because it is clear that there is an opportunity to render a service that will advance the art of flying and its economic development. We are glad to welcome into our organization a group of men of the type responsible for the splendid record and fine prestige that *Aviation* now enjoys.

Publishing headquarters of *Aviation* will continue in New York. Earl D. Osborn, who has been publisher of the periodical for several years, will join the McGraw-Hill organization.

◆

Eastern Massachusetts Would Amend Agreement

A subcommittee of the general conference board of unions, the members of which are employed by the Eastern Massachusetts Street Railway, Boston, Mass., have been told by the trustees of that company that the company cannot operate at a profit and pay the existing wage scale. The committee was asked to take a cut which would affect 1,500 employees. They were also asked to relinquish their rights to the arbitration of discipline cases.

The result of this conference between trustees and the committee leaves an understanding that it will be impossible for the Eastern Massachusetts to renew the present agreement. Further agreements then must be only under the condition that the men be willing to meet the company half way in revising wages.

COMING MEETINGS OF *Electric Railway and Allied Associations*

***March 12-14*—Oklahoma Utilities Association, annual meeting, Oklahoma City, Okla.**

***March 14-15*—Illinois Electric Railway Association, Hotel Abraham Lincoln, Springfield, Ill.**

***March 20*—Central Electric Traffic Association, Keenan Hotel, Fort Wayne, Ind.**

***May 1-3*—Indiana Public Utilities Association, Indiana Gas Association and Indiana Electric Light Association, annual joint convention, Hotel Gary, Gary, Ind.**

***May 13-15*—National Highway Traffic Association, annual meeting, Stevens Hotel, Chicago, Ill.**

***May 15*—Association of Electric Railway Equipment Men, Middle Atlantic States, semi-annual meeting, Wilmington, Del.**

***June 5-7*—Canadian Electric Railway Association, annual convention, Montreal, Quebec.**

***June 21-22*—New York Electric Railway Association, Bluff Point, N. Y.**

***June 27-28*—Central Electric Railway Association, Michigan City, Ind.**

***Aug. 15-16*—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.**

***Sept. 28-Oct. 4*—American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium, Atlantic City, N. J.**

Court Dismisses Suit Against Seattle Municipal

Superior Judge J. F. Ronald on Feb. 15 rendered a decision giving the Seattle Municipal Railway a clean bill of health financially, and freeing it from threatened insolvency and default in its bonded obligations. The ruling is regarded as a complete victory for the sponsors of the Municipal Railway in the J. G. Von Herberg suit. Attorneys for Mr. Von Herberg, however, immediately served notice of appeal.

A few minutes after the decision of Judge Ronald, the city wired $1,062,225 to New York to meet principal and interest payments due on street railway purchase bonds. The payments had been held up by a temporary restraining order, which was dissolved by Judge Ronald's decision.

In dismissing the two-year old suit of Von Herberg as "without merit," Judge Ronald took the plaintiff to task for harassing the city by litigation, and praised the City Council and management of the system for efficient management, at the same time expressing confidence that the street railway, if unhampered by further litigation, would be able to pay off its debts and operate efficiently out of its revenues.

Judge Ronald held that the railway system is solvent; that the City Council has a right to loan it money from other utility funds; that the system is now in better condition than when purchased from the Puget Sound Power & Light Company ten years ago.

He pointed out that since the trial of a similar suit brought by S. B. Asia in January, 1922, the railway has reduced to $183,313 an operating deficit which at that time amounted to $1,500,000, besides meeting all installment payments when due and adding much to the system's value. Purchase payments, since the acquisition of the railway, he enumerated at $12,977,413 up to Dec. 31, 1928, in addition to $2,162,477 paid out for extensions and betterments, and $1,977,500 on other utility bonds and warrants, notwithstanding that the system has been compelled to charge off $1,479,356 for retirements and abandonments in the meantime. Furthermore, the court found, the railway fund, with the $800,000 loan from the Water Department, had on hand $1,200,000, and operating receipts amounting to about $16,000 a day, with which to meet obligations of $1,576,600 due this year.

In the course of the trial, testimony was introduced by the city to show that an annual saving of $440,000 in operating costs of the railway system will be made by an economy program already under way. Railway officials declared that the present equipment, while obsolete in design, can be continued in service indefinitely without excessive costs for repairs. An expert, who testified for Mr. Von Herberg, had represented the railway as rapidly approaching a physical collapse which could be averted only by excessive expenditures for rolling stock and track replacement.

Interurban to Give Local Service in Newcastle

Abandonment of railway service in Newcastle, Ind., by the Terre Haute, Indianapolis & Eastern Traction Company, has been authorized by the Indiana Public Service Commission. The company was ordered, however, to give local service on the interurban line it operates into Newcastle at a fare of 5 cents within the city.

Reply Brief Filed in St. Louis Fare Case

The city of St. Louis, Mo., in a brief filed with the Cole County Circuit Court at Jefferson City on Feb. 21, renewed its attack on the decision of the Missouri Public Service Commission fixing a straight 8-cent fare in St. Louis effective last July 1.

The case was carried into the Circuit Court when the city asked for a review of the commission's decision. It was argued on Jan. 31, last. The attack in the brief centered on the $63,500,000 valuation allowed the company. The city contends that on a proper valuation the 8-cent fare is excessive.

Evidence on Chicago "L's" Plea for Permanent Injunction

Charles E. Thompson, vice-president Chicago Rapid Transit Company, testified recently before Roswell B. Mason, master in chancery, that he did not consider that the present 10-cent fare on the elevated system in Chicago is adequate to provide a fair return on the company's investment. Evidence is being heard by the master on a petition of the Rapid Transit Lines for a permanent injunction restraining the Illinois Commerce Commission from interfering with the 10-cent rate of fare established last fall.

Mr. Thompson pointed out that since the higher fare was put into effect 1928 revenues had fallen slightly below those of 1927, but that operating expenses also had decreased. On the basis of the state commission's valuation of $92,588,000 on the company's properties, he added, the company earned a return of only 3.33 per cent last year. He declared, however, that more seats were available now in proportion to passengers carried than under the former 8⅓-cent fare.

Suburban Towns Accept New Twin City Fare

Another step in settling the fare question for all divisions of the Twin City Rapid Transit Company, Minneapolis, Minn., is a stipulation ordered by the Councils of Stillwater, Minn., and Bayport, Minn., both on the Stillwater division of the Minneapolis & St. Paul Suburban Railroad, to be filed with the Minnesota Railroad & Warehouse Commission, providing for a cash fare of 10 cents and a token rate of 7½ cents. The question has already been settled for the Twin City divisions and a petition was pending before the commission for increased rates of fare in these two cities which have just ordered stipulations accepting the increased fare.

Ticket Rate Reduced in Ottawa

A reduction in fares has been announced by the Ottawa Electric Railway, Ottawa, Ont. The new schedule provides for seventeen tickets for $1, against sixteen under the old rate. The reduction does not affect the four-ticket strips, now sold at 25 cents, and single fares will continue on a basis of 7 cents. The 7-cent fare went into operation last August.

Preparing to Consider Louisville Plea

The increase in railway and bus fares in Louisville, Ky., asked by the Louisville Railway, is expected to be handled by the Board of Public Works soon. The company seeks a 10-cent cash fare, but has left the matter of a possible bulk sale rate open for the purpose of experiment. Meanwhile the Public Utilities Bureau has reported on the appraisal of the property of the company.

Among business and financial men the feeling is that the company will get an increase. In fact, the impression prevails that the company proposal will receive a measure of consideration fully in keeping with the spirit in which the company's plea was advanced.

Rehearing of Elgin Fares Asked

A petition asking a rehearing of the Illinois Commerce Commission order, authorizing an increase in commutation rates on the Chicago, Aurora & Elgin Railroad, has been filed with the commission by a group of the company's patrons residing in Wheaton, Ill. The new rates became effective on Jan. 23. They are slightly higher than those of competing steam railroads between Chicago and west suburban points.

Approval by the commission of the railroad's application for an increase in fares was based upon the estimate of commission engineers that the railroad had earned a return of only 3.4 per cent for the year ended July 31, 1928. The commission also found that the company had expended $1,800,000 for improvements which had not been financed through the issuance of securities and "which under proper earning conditions it is entitled to capitalize."

In view of this situation and the fact that wages of all trainmen had recently been advanced, the commission held that an increase in rates was necessary to give the public the service to which it is entitled, permitting the company to earn sufficient return to attract new capital.

Wage Increase Granted in Indianapolis

A wage increase of 4 cents an hour to all motormen and conductors has been announced by officials of the Indianapolis Street Railway, Indianapolis, Ind., effective from Feb. 24. The increase was granted voluntarily and will add approximately $120,000 to the 1929 payroll. Increases will be granted in other departments.

A minimum wage for beginners of 44 cents an hour, increasing 1 cent an hour a year to a maximum of 49 cents an hour for operators of two-man cars is provided. A minimum of 49 cents an hour for beginners, increasing 1 cent a year to a maximum of 54 cents is provided for operators of one-man cars. The last wage increase was 3 cents an hour in 1927.

James P. Tretton, general superintendent, said that with a net decrease in operating expenses during 1928 of $120,000, the company was able to raise the wages of its men as it had promised. A further saving in 1929 is desired for needed repairs and the cordial co-operation of employees has been asked to make this possible, since the company would regret a circumstance that might require it to file a petition for increased fares.

An increase of 5 cents an hour to drivers of buses of the People's Motor Coach Company, a subsidiary of the Indianapolis Street Railway, has been announced. The increase was effective on Feb. 24. It will make the scale for coach drivers the same as that of drivers for the Indianapolis Street Railway buses.

The present scale of the coach company drivers is from 40 to 45 cents an hour. Under the terms of the announcement it will be increased to 45 to 50 cents an hour. The wage scale of drivers of the buses for the railway will remain the same.

Fare Increase Ahead in Portland

With two more community clubs petitioning for additional bus service, W. H. Lines, vice-president Portland Electric Power Company, Portland, Ore., has told the City Commissioners and the Council that not only can the company not grant this request, but that it is possible an increase in fare may be necessary to care for lines already running unless returns become more satisfactory. Mr. Lines pointed out that the buses are losing $125,000 a year now, and that for some time the company had been considering an appeal to the Public Service Commission which would relieve the situation. Mayor Baker told the community clubs that the Council would do what it could to assist in arranging for service by a private operator, but he indicated that he would do so only if an arrangement could be worked out that would not interfere with service already being given in the vicinity by the Portland Electric Power Company.

Recent Bus Developments

Interstate Bill Not Likely to Pass

Adjournment of Congress without action on the Parker bill to regulate interstate bus traffic was regarded as likely on Feb. 27. Uncertainty on the part of the interstate commerce committee of the House, to which the bill was referred, and the crowded state of the legislative calendar made it seem useless to try to bring the measure up on the floor in the few remaining days of the session. Whether there will be an opportunity of getting a vote on the bill during the extra session is still undetermined. There is an element in the committee that believes that the measure goes too far in its regulation.

Further Delay in Equitable Proceeding

The Equitable Coach Company, New York, is expected by city transit experts to let its franchise lapse on April 1, the time limit set by the Board of Estimate early this month. On Feb. 27 the company asked the Board of Estimate for permission to withdraw applications to amend its franchise in such manner as to make possible the B. M. T. merger and the operation of Manhattan buses by a new corporation. This request, which probably would be granted as a matter of course, would result in a delay of at least eighteen months in putting buses on the city streets, even if the Equitable succeeds in getting Transit Commission approval within the time limit set.

The New York *Times* sees the company forced with a demand for legislative inquiry into the circumstances under which it obtained its bus franchise nearly two years ago, threatened by a suit by the B. M. T. for breach of its contract to merge Brooklyn and Queens bus routes with trolley lines, and confronted with stubborn resistance from traction groups when it again seeks the Transit Commission approval, without which bus operation is impossible.

Line in St. Louis Suspended Temporarily

The St. Louis Public Service Company on Jan. 7 received from the Circuit Court for Cole County an order directing it temporarily to suspend operations of its bus line between Maplewood and Kirkwood, Mo., via the Manchester and Big Bend roads. This line was opened by the railway a few months ago after residents of the districts served had complained to the Missouri Public Service Commission regarding the character of service being offered by the De Luxe Bus Line which had been operating over the same routes.

At the time a state permit for the bus line was granted to the St. Louis Public Service Company, the De Luxe Line was ordered to suspend operations. This it refused to do, appealing to the Circuit Court for relief. In the meanwhile the De Luxe company readjusted its schedules.

Taxi War in Louisville

Wild-cat operation of twenty-five cents cabs brings drastic regulation. Ordinance contested

A NEW ordinance has gone into effect at Louisville, Ky., regulating cabs, and forcing them to carry insurance or bond to protect the public and property, operate with meters and regulate the employment of drivers. The measure stipulates the maximum fare that may be charged. The ordinance will materially increase operating costs for all cab companies. The Louisville Taxicab Company will carry a bond, but will write its own insurance. Some of the small companies will not be able to secure bond, and insurance rates are very high. Many that have been buying cabs on time are expected to drop out.

Situation Had Become Intolerable

All in all, however, it seems very likely now that a situation which had grown to be intolerable will soon be corrected. For years Louisville had a taxicab company which operated good equipment at rates comparing favorably with rates of well conducted companies in other large cities. In the fall of last year, however, Columbus, Ohio, interests came in with a 25-cent cab company, offering to haul at the rate of 25 cents for 2 miles, with additional mileage at the rate of 12½ cents a mile. Another company came in from Ohio with a rate of anywhere within the city for 25 cents, but later changed this to three miles for 25 cents, or 8⅓ cents a mile, with additional mileage at 10 cents a mile. Then some small companies formed. The Louisville Taxicab & Transfer Company met the competition and added more than 100 light cars. From a total of about 200 cabs in use, some part time, the number jumped to about 400 or 450 cabs, all carrying four passengers for one fare, and at rates of 8⅓ to 12 cents a mile.

A few days ago the Dodds Twenty-five Cent Cab Company filed a voluntary petition in bankruptcy with 57 claims pending against it for accidents. None of the other companies, with the exception of the Louisville Taxicab & Transfer Company, the old line company, has been able to comply with the law. About the time the cabs were to be ordered off the streets, an injunction was asked, pending investigation of the legality of the new ordinance. Enforcement of the law is held up pending decision in this suit.

Passes for Maryland Interurban Buses House to House Canvass

Use of the weekly pass in six varieties was started on Monday, Dec. 31, 1928, by the Cumberland & Westernport Transit Company. Most of the passes replace a reduced-rate ticket book which consisted of twelve (two a day) tickets and a Sunday pass. These tickets were good only over one of three routes terminating respectively at Cumberland, at the Kelly-Springfield tire plant and at the Celanese plant, both of which are just outside of Cumberland but on different highways.

The passes sell for $1.50 up to $5, according to distance, and are also available on all three routes. In some cases they cost even less than the former ticket books.

The company has decided to try the pass in an effort to combat more successfully the practice of auto-owning workmen selling rides to their comrades. As this competition is between their homes and the two plants as a rule, the passes include riding privileges to Cumberland as well. An intensive house-to-house canvass is being made under the direction of D. D. Price, general manager. Fifty-six passes were sold in the first week, which contained a holiday. At the expiration of the third week the sale had been more than doubled despite the handicap of the influenza epidemic.

Would Incorporate South Side Motor Coach

Petition of the Beech Grove Traction Company, Indianapolis, Ind., for authority to buy the South Side Motor Coach Company, a competing bus line, for $22,500 has been filed with the Indiana Public Service Commission. In the petition the company states its plan to incorporate the bus company as the South Side Motor Coach Corporation. Eight buses, which originally cost about $40,000, constitute the principal equipment of the company. The railway plans to spend $17,500 for new equipment and $10,000 for new buildings.

New Regulatory Measure Likely for Rochester Taxis

City Manager Stephen B. Story, Rochester, N. Y., on investigation of the complaint by James F. Hamilton, president of the New York State Railways, that the 25- and 35-cent taxis are violating city ordinances, said that doubtless a new ordinance regulating taxi fares would be drafted. He found that the rules of the city safety department fixing fares was not being enforced. The rates fixed by the department call for 30 cents for the first ⅓ mile and 40 cents for the first ⅔ mile, with a charge of 10 cents for each third of a mile thereafter. The city manager classed the 25- and 35-cent taxis as "trippers" within the scope of the jitney law, but not subject to city regulation at present. Mr. Story said that what will come is a new ordinance that will fix the rates of metered cabs and also "tripper taxis."

◆

Nighthawk Taxis May Cruise in Worcester

The Worcester, Mass., license board has decided to permit taxicabs to cruise without restraint between the hours of midnight and 6 a.m. There had been a rule prohibiting such solicitation on the grounds that it interfered with railway traffic since the Worcester Consolidated Street Railway had established all-night service on a few of its lines.

◆

Nashville-Old Hickory Service by Railway

Service of the Tennessee Transportation Company, subsidiary of the Nashville Railway & Light Company, Nashville, Tenn., and operator throughout Nashville, has just been expanded to take over buses to and from Old Hickory, co-ordinating them with Nashville street cars and motor coaches.

Hourly service is being furnished, reaching Old Hickory now by way of Donelson. It is understood that the Gallatin Pike will also be used when the new river bridge is opened.

Free transfers are issued either from street car or city motor coach to the Old Hickory coach, thus linking Nashville and Old Hickory closer than they have ever been.

The purpose was to make the Old Hickory fare 50 cents per trip, but at the present time, reduced rates are being offered through the use of commutation books. Transfers are acceptable at the Union Bus Terminal on Commerce Street. Twelve rides to Old Hickory or back sell for only $3. Twelve rides from Nashville to Donelson, or from Donelson to Old Hickory, sell for only $2.

Permission for the expansion of this service was granted the Tennessee Transportation Company by the State Railroad & Public Utilities Commission.

◆

New Service on Winsted Run

Buses replaced cars on the Winsted-Torrington, Conn., line of the Connecticut Company on Jan. 13. Seven of the ten trolleys used on the line are to be scrapped. The other three have been sent to Waterbury to be used on that division. The bus line schedule calls for buses to leave Waterbury for Winsted at fifteen minutes after the hour from 7:15 a.m. to 6:15 p.m. and another trip at 8:15 p.m. Buses will leave Torrington for Winsted ten minutes after the hour from 6:10 a.m. until 10:10 p.m. Buses will leave Winsted for Torrington on the hour from 6 a.m. until 10 p.m.

Substitution in Ohio

Thirty-six-mile interurban of Northern Ohio Company to give way to railway's buses and trucks

APPLICATION has been filed by the Northern Ohio Power & Light Company, Akron, Ohio, with the Ohio Public Utility Commission for abandonment of its interurban car line from Massillon to Uhrichsville, Ohio, a distance of 36 miles. A. C. Blinn, vice-president and general manager, signed the plea. The hearing has been set for April 2, and the necessary legal notices have been published. The company plans to substitute bus and truck service for its present rail lines between Massillon and Uhrichsville.

LINE IN USE TWENTY-FIVE YEARS

Interurban cars have been operated over the line continuously since the road was completed 25 years ago, serving the cities and villages of Navarre, Justus, Beach City, Strasburg, Dover, New Philadelphia, Midvale and Uhrichsville among other places.

In its petition the company declares that the tracks are located for a portion of the distance upon the highway, for a part on private right-of-way and for part upon city streets; that service was pursuant to certain franchises; that all of these franchises have expired except with the village of Navarre and that the tracks are being maintained by sufferance.

In view of this, the right is asked to cease all interurban operation between the entrance to the Massillon State Hospital and the southern terminus in Uhrichsville. In addition the company sets up the plea that the loss from operation of the line has been increasing from year to year; that there is sufficient transportation service for the convenience and necessity of the public between Massillon and Uhrichsville and continuance of interurban service is unnecessary; that there has been proposed, and in process of designing and building, public road improvement which will require removal and replacement of track requiring capital investments so heavy as to make continued operation economically unsound.

HISTORY OF COMPANY REVIEWED

This interurban was built in sections. The companies that went to make it up were known as the Canton-New Philadelphia Railway and the Tuscarawas Traction Company. They, with the Canton-Akron Railway, were united under the name of the Canton-Akron Consolidated Railway. In 1906 this company was taken over by the Northern Ohio Traction Company, which in turn was absorbed by the Northern Ohio Traction & Light Company. Two years ago the name was changed and operation continued by the Northern Ohio Power & Light Company.

Nine months ago the interurban line between Canton and Akron was abandoned and bus service substituted. The Cleveland-Akron-Canton Bus Company, a subsidiary of Northern Ohio Power & Light, has been granted the right to operate an interurban bus line through the cities and towns served by the railway.

◆

Extension of Los Angeles Service

The Los Angeles Railway Corporation and Pacific Electric Railway have filed a joint application for a certificate of public convenience and necessity to operate motor coach service temporarily, under the name of Los Angeles Motor Coach Company, between the terminus at Santa Monica Boulevard and Wilshire Boulevard, and a proposed terminus at the University Drive entrance to the University of California, southern branch, in the city of Los Angeles, as an extension of present motor coach service.

◆

Flat Rate Taxis Opposed in Springfield, Mass.

Petitions for permits to operate taxicabs at flat rates of 35 to 50 cents a ride for any distance within city limits, presented to the municipal transportation board of Springfield, Mass., are opposed by the Springfield Street Railway and also by some of the larger cab concerns.

◆

Rights Sought by Omaha Company

A committee of three has been appointed by Mayor Dahlman of Omaha, Neb., to consider two applications made to the City Council for bus line extensions on the part of the Omaha & Council Bluffs Street Railway. J. N. Shannahan, president of the railway, had 29 similar petitions for bus lines as well as two for rail extensions on file. These petitions have also been turned over to the special committee which will investigate the existing conditions.

If the facts found by the committee warrant an extension or an introduction of rail or bus lines, service will be given in accordance with the policy of the railway to provide the city transportation in the best possible manner. Mr. Shannahan voiced this sentiment when he said:

> You have given us the monopoly of local transportation service and we are bound to serve the city.

It is estimated that the initial cost for the bus lines for which rights are sought would be $274,000 and the initial cost of the rail extensions asked would be $71,000.

◆

Experimental Service by San José

The San José Railroad has applied to the Railroad Commission for authority to abandon its passenger bus service on Morton Avenue to Tillman Avenue and along Tillman Avenue to Park Avenue in Hanchett Park, Cal. Permission is also asked to establish an experimental bus service for one year between the intersection of Martin Avenue and The Alameda, San José, and the intersection of The Alameda and Hedding Street.

Financial *and* Corporate

Smaller Net in Baltimore

United Railways & Electric Company earned only $1.36 a share in 1928, but conditions are improving

SURPLUS earnings of the United Railways & Electric Company, Baltimore, in 1928 equaled $1.36 a share on the outstanding common stock. This compares with $1.66 a share in 1927 and $2.47 a share in 1926. The calculations are based on preliminary figures and do not take into consideration annual adjustments at the closing of books at the end of either year.

The company's gross earnings in December showed a substantial increase in response to the increased fare. This increase, allowed by the Public Service Commission, from a fare rate of three for a quarter to four for 35 cents, represented an increase of only 45/100 of a cent. This, it was thought, and so far has proved, to be insufficient to provide for the increased depreciation ordered at the same time by the commission.

While the company benefited to the extent of putting aside for depreciation $136,555 in 1928 compared with $70,000 in December, 1927, the net result to surplus for December, 1928, was $65,879 as against a surplus of $91,678 in 1927. This surplus represents income over and above all interest charges, including interest on income bonds.

For the twelve months of 1928, before annual adjustments at the closing of books for the year, the statement shows gross passenger revenues of $16,060,894, or an increase of $104,880, over the year 1927. A statement says:

> Annual adjustments at the end of the year frequently make a substantial change in the net income from that shown in the preliminary statement. The present statement, however, shows the 1928 net as $558,393 after payment of all interest, including income bond interest. This was about $123,000 less than in 1927.
>
> Increased operating expenses for the year were $249,595. This was due to increased depreciation, the higher wage scale that went into effect this year, and other small items.

STATEMENT OF EARNINGS OF THE UNITED RAILWAYS & ELECTRIC COMPANY, BALTIMORE

	1928	1927	Increase	Decrease	Per Cent
Passenger revenue	$16,060,894	$15,956,013	$104,880	....	.64
Other revenue	212,912	233,727	......	$20,815	8.91
Total	$16,273,806	$16,189,741	$84,064	....	.52
Operating expenses:					
Way and structures	$872,703	$841,535	$31,167	....	3.70
Equipment	917,315	907,550	9,765	....	1.08
Power	1,421,823	1,387,832	33,991	....	2.45
Conducting transportation	5,158,662	5,143,117	15,545	....	.30
Traffic	25,594	15,474	10,120	....	65.40
General and miscellaneous	1,606,048	1,535,354	70,693	....	4.60
Transportation for Investment-Cr	*6,919	*16,025	9,106	....	56.82
	9,995,228	9,814,839	180,389	....	1.84
Depreciation	878,693	809,487	69,206	....	8.55
Total	$10,873,921	$10,624,326	$249,595	....	2.35
Net operating revenue	5,399,884	5,565,415	......	165,530	2.97
Taxes	1,578,782	1,593,143	......	14,361	.90
Operating income	3,821,102	3,972,271	......	151,169	3.81
Non-operating income	150,823	159,230	......	8,406	5.28
Gross income	3,971,926	4,131,502	......	159,575	3.86
Fixed charges	2,853,532	2,889,315	......	35,782	1.24
Remainder	1,118,393	1,242,187	......	123,793	9.97
Interest on income bonds	560,000	560,000	......	....	.....
Net income	$558,393	$682,187	......	123,793	18.15
Car-miles	33,013,320	33,979,657	......	966,337	2.84
Seat-miles	1,561,348,818	1,592,238,132	......	30,889,314	1.94
Revenue passengers	$200,466,304	$218,714,410	......	$18,248,106	8.34
Transfer passengers	$82,997,639	$89,039,613	......	$6,041,974	6.79
Revenue passengers per car-mile	6.0766	6.4440	......	.3674	.....
Maintenance cost per car-mile	.0554	.0524	.0030	....	.....
Depreciation cost per car-mile	.0266	.0238	.0028	....	.....

*Credit.

NOTE:—Increase in rates of fare, effective at midnight Feb. 12, 1928, from 8—7½ cts. for adults and 4 cts. for children to 9—8⅓ cts. for adults and 5 cts. for children, without change in commutation or school ticket rates. Further increase to 10—8¾ cts. for adults became effective Dec. 1, 1928.

For the month of February, revenues and expenses were for 29 days in 1928, as compared with 28 days in 1927. Expenses for 1928 are at increased wage over 1927—2% effective Jan. 1st and additional 2% effective Feb. 12.

NET INCOME OF UNITED RAILWAYS & ELECTRIC COMPANY BY MONTHS

	1928	1927	Increase	Decrease	Per Cent
January	$18,366	$72,128	....	$53,761	74.54
February	18,769	27,590	....	8,820	31.97
March	63,255	81,509	....	18,254	22.40
April	37,535	61,000	....	23,465	38.47
May	61,738	63,529	....	1,791	2.82
June	30,009	41,721	....	11,711	28.07
July	34,506	36,370	....	1,863	5.12
August	20,453	20,849	....	395	1.90
September	39,034	38,691	$342.82	......	.89
October	92,584	72,738	19,845.87	......	27.28
November	76,260	74,379	1,881.12	......	2.53
December	65,879	91,678	....	25,798	28.14
	$558,393	$682,187	....	$123,793	18.15

◆

Dividends Resumed by Twin City Company

The Twin City Rapid Transit Company, Minneapolis, Minn., has resumed dividends on the common stock by the declaration of a quarterly dividend of $1, payable on April 1 to stock of record March 12. The last previous dividend was $1 quarterly, paid July 2, 1928.

◆

Warren-Jamestown Line May Be Abandoned

Abandonment of the Warren & Jamestown Street Railway line between Warren, Pa., and Jamestown, N. Y., is expected. The line, which is 21 miles long, was opened in 1902 and has maintained hourly service in each direction for the greater part of that time. Of late, however, the opening of bus service between the two towns by the West Ridge Transportation Company has materially cut down the railway's revenue and a meeting of officials, at a hearing for approval of a franchise for the bus company, brought that the railway would surely make application for abandonment shortly.

◆

Increase in Capital Stock of Jamaica Central

Jamaica Central Railways, Long Island City, N. Y., has filed a certificate in the office of the secretary of state increasing the number of shares of its capital stock from 2,000 to 12,000 shares, no par value.

◆

Lower Net Income on Brooklyn-Manhattan

Total operating revenues of the Brooklyn-Manhattan Transit System, Brooklyn, N. Y., for the six months' period ended Dec. 31, 1928, were $24,135,351 against $23,617,381. Operating expenses increased from $15,378,210 to $15,710,730. After the consideration of total income deductions, the net income was $3,106,141 for the six months' period ended Dec. 31, 1928, and $3,123,306 for the 1927 period.

◆

Another Income Bond Payment

Directors of Third Avenue Railway, New York, have declared an interest payment of 1¼ per cent on the adjustment mortgage 50-year 5 per cent income bonds, payable April 1, 1929. Similar payment was made Oct. 1, 1928. Total arrears on the issue is 31½ per cent.

Local Business Men Added to Omaha Board

Seven new directors were elected at the annual meeting of the stockholders of the Omaha & Council Bluffs Street Railway, Omaha, Neb., recently. All are prominent Omaha business men. The new directors are:

William Diesing, vice-president Cudahy Packing Company, and member of its Omaha branch; John W. Robbins, collector of customs for the Port of Omaha, realtor, and real estate investor; Arthur Metz, capitalist; P. F. Petersen, president P. F. Petersen Baking Company; Kirk Griggs, president Occidental Building & Loan Association; W. H. Schellberg, president Union Stockyards Company; and O. H. Barmettler, vice-president and general manager Iten Biscuit Company.

President Shannahan said:

> In recommending to the stockholders additional names for the board of directors, I had in mind that settlement of the street railway problem in Omaha is of vital interest to the city as well as to the company.
>
> When I asked the new members for the privilege of nominating them for election to the board, I told them they were being asked to perform a civic service. They agreed on that basis, and I am sure their counsel will be helpful to the city and to the company.

The other seven board members are: John A. Munroe, F. B. Johnson, J. N. Shannahan, Fred Hamilton, Louis C. Nash, W. A. Smith and Emmet Tinley.

◆

Would Abandon Service in Independence

Permission to discontinue its city service in Independence is sought of the Public Service Commission in an application by the Kansas City Public Service Company. The plea says the local service in Independence has been operated at a loss for several years, estimated as ranging from $4,000 to $15,000 a year, because of a general decrease in patronage.

◆

Small Municipal Line Shows Improvement

Gross income of the Athol & Orange Transportation Area, 6-mile municipally-owned railway, decreased in 1928 compared to the previous year, but as expenses were kept down a larger profit was shown than in 1927. The trustees report that the employees went through the year without a single accident to person or property.

Receipts from passengers totaled $41,522. Receipts from other sources brought the gross to $42,823. The largest expense was for power, $12,546. Other expenses included, way and structure, $5,898; equipment, $10,445; conducting transportation, $9,443; general and miscellaneous, $2,806; interest, $720; taxes, $204.

Receipts from passengers in 1927 totaled $43,692, or $2,169 more than in 1928. The 1927 receipts over expenses were $622 and the 1928 receipts over expenses, $750.

On the balance sheet the road and the equipment are listed at $21,318. Cash is shown as $8,490 and total assets are listed at $84,316.

◆

Highest Return in Ten Years in Youngstown

Gross revenue of the Youngstown Municipal Railway, Youngstown, Ohio, increased 4.03 per cent in 1928, compared with 1927, although the total number of passengers carried decreased 1.12 per cent. In the year the mileage of car and bus operation decreased 1.38 per cent.

This reduction and other economies, together with the increase in fare effective on Feb. 27, 1928, brought an increase in the net balance with the result that the return to the company after all charges, including depreciation, was 5.48 per cent upon the agreed capital value under the ordinance, the highest return in the ten years of operation under the service-at-cost plan.

COMPARISON OF RETURNS AT YOUNGSTOWN FOR 1928 AND 1927

	1928	1927
Total passengers carried......	30,996,943	31,345,360
Car and bus-miles operated...	5,712,471	5,792,898
Gross revenue..................	$2,022,368	$1,943,897
Balance available, after all charges, for stipulated return	$246,173	$55,706
Agreed valuation under franchise........................	$4,490,297	$4,487,659
Per cent return on valuation..	5.48	1.24

The improved showing of the Youngstown lines is attributable largely to the change in rate of fare which became effective on Feb. 27, 1928. Prior to that time the rate of fare had been 9 cents cash, seven tokens for 50 cents and 1 cent for a transfer. The rate of fare effective throughout the last ten months of the year was 10 cents cash, six tokens for 50 cents, $1.50 weekly pass and free transfers.

The Youngstown service-at-cost franchise went into effect on Jan. 16, 1919. It allows a 7 per cent return to the company upon the basis of the agreed capital value as defined by the ordinance. The actual return earned by years follows:

Year	Per Cent on Investment	Year	Per Cent on Investment
1919.......	2.73	1924.......	2.49
1920.......	3.81	1925.......	4.27
1921.......	1.16 loss	1926.......	4.48
1922.......	1.76	1927.......	1.24
1923.......	2.55	1928.......	5.48

◆

Record Established in Toledo

January established an all-time record for the Community Traction Company, Toledo, showing total revenue of $370,560, an increase of $70,000 more than the similar month a year ago. After allowing for all reserves provided by the Milner ordinance, there was a net surplus of $20,833 available for the stabilizing fund. The deficit is now reduced to $1,126,375 and the new fare stabilizing fund stands at $85,864.

Passenger revenue in January was $351,802, or a gain of 24 per cent more than the similar month last year. Good employment conditions in Toledo industries, active business, severe weather with icy streets, and extension of the service of the company to provide better transportation facilities are all credited with contributing to the big gains. A total of 3,895,821 passengers was carried on street cars and 1,149,233 passengers on bus lines. The combined showing is nearly 1,000,000 passengers better than that for January last year.

Two of the new bus lines established on Jan. 1 made a profit and two others broke nearly even.

◆

Finances of Eastern Massachusetts in Good Shape

About a fortnight ago the initial ten-year period of public operation of the Eastern Massachusetts Street Railway, Boston, Mass., came to an end. The feeling of the Boston News Bureau was that no account of the stewardship of the trustees would be complete without a reference to their achievements in the important matter of debt reduction. To that end the paper explained:

On Feb. 1, next, some $331,000 South Shore & Boston Street Railway 6s, extended, come due and will be paid off from treasury cash. Including this maturity, there will have been retired during the decade of public operation a total of $7,225,150 of bonds and equipment trust notes. This has all been done without recourse to new financing of any kind.

On Dec. 1, next, there will fall due an issue of $3,352,000 Lynn & Boston Railroad extended 6 per cent bonds. The road holds in its treasury 1,088,000 of these bonds, leaving the amount outstanding in the hands of the public $2,264,000. This maturity likewise will be taken care of without the necessity of refunding. At present, Eastern Massachusetts has $1,250,000 cash and has free, marketable securities or securities in reserve accounts in excess of the net amount of the Dec. 1 maturity. In other words, the road could pay off the bondholders today without touching its cash, and this makes no allowance of course for the reserves that will be accumulated between now and next Dec. 1 from operation of the property.

After the Lynn & Boston issue has disappeared from the balance sheet, Eastern Massachusetts will have outstanding bonds aggregating a principal amount of $19,936,447. There reposes in its own treasury $855,550 of these bonds, so that the net funded indebtedness in the hands of the public will be $19,080,897, all maturing on Jan. 1, 1948, or nearly nineteen years hence. Furthermore, it is a fact to be remarked upon that some $14,303,000 of this $19,000,000 odd total bears 4½ per cent interest. In other words, Eastern Massachusetts will have the use of a substantial bulk of capital for the next nineteen years at a rate that will make a favorable comparison with almost any other street railway.

The number of Eastern Massachusetts Street Railway common shares outstanding is 82,664. Earnings available for the common stock for 1928 were $1.55 a share.

Legal Notes

Kentucky—*Depot May Be Abandoned Where No Longer Required by Public Needs, Provided No Contract Required Its Maintenance Forever.*

A railroad constructing a depot pursuant to a contract with an adjoining landowner which did not require the depot to be maintained for any particular time could abandon the depot when public interest no longer required it, regardless of the enhanced value of the land of the adjoining owner. [Johnson's Adm'x vs. Louisville & N. Ry., 11 S.W. (2d) 96.]

Louisiana—*A Girl Eleven Years and Nine Months of Age, Intelligent, Robust and Bright, Is Capable of Negligence.*

Plaintiff claimed $20,000 damages for the loss of love and society of his child and for the pain and suffering he had endured because of her early death, and for the loss of support in his old age which he could have expected from his child. A jury awarded $12,000, a judgment which the court affirmed. On appeal the Court of Appeals ruled that recovery cannot be had against a street railway for injury to a pedestrian unless the railway was at fault. The court could perceive no negligence on the part of the company, rejecting the contention that the brakes of the car were not in good order and holding that fenders used on street cars for years would be considered to comply with the law unless proved inefficient. [Hargus vs. New Orleans Public Service, 118 So. 847.]

Michigan—*Owner Must Be Compensated for Damages to Remaining Land Where Part of Land Is Taken for Highway.*

Michigan wanted to build a new highway. To do so it was deemed essential to acquire a part of the right-of-way of the Detroit, Grand Haven & Milwaukee Railway. Johnstone, Pohlmeyer and others sought to enjoin the defendants, claiming among other things that the relocation would seriously affect private residential estates. The principal question was whether, because of the proposed violation of the restrictions, the state must pay compensation to the owners of other lots in the subdivision, whose land is not actually and physically taken under the Constitution which prohibits private property being taken for public use without just compensation. The court ruled that although condemnation proceedings are conducted under Highway Law, Pub. Acts 1925, No. 352, and Pub. Acts 1927, No. 340, it is duty of commissioners to compensate the owner for what his landed interest will suffer from use proposed to be made of it by the railroad. [Johnstone vs. D., G. H. & M. Ry., 222 N.W., Rep. 325.]

New Jersey—*Town Council May Not Revoke Bus Consent by Resolution Without Notice, Hearing and Approvel of Service Commission.*

The Town Council of Secaucus had previously passed a resolution revoking and rescinding municipal consent authorizing the Public Service Transportation Company to operate buses through the town. The Board of Public Utility Commissioners held this revocation to be unlawful and the court sustained this contention since the revocation had been brought about without notice and hearing and without the approval of the board. The position of the board was that the consents granted were necessary and proper for the public convenience and conserved the public interest. The Hudson County Bus Owners Association and others sought a writ of certiorari to review the order of the commission approving the application of the transportation company for a permit to operate between certain towns. The court held the plea to be without legal merit. [Hudson County Bus Owners Association vs. Board of Public Utility Commissioners, 143 Atl. Rep., 755.]

New Jersey—*Negligence for Car to Hit Man Dismounting from Truck Standing Near Track.*

Where a motorman knew, or should have known, that a truck had stopped in front of his car close to the track, and with the mechanical arm out, he should have slowed his car down almost to a standstill, and should have anticipated that someone on the truck might get off on side nearest track. [Markowski vs. Public Service Ry., 143 A., 740.]

New York—*Power of Eminent Domain Is Inherent In Every Sovereign.*

This was a proceeding brought indirectly by the state to acquire title to, and possession of, certain property of the Fonda, Johnstown & Gloversville Railroad, a combined electric and steam railroad in Fulton County, the stated purpose being the construction of a dam and reservoir for the regulation of the flow of the waters of Sacandaga River, which lie within the territory of the Hudson River regulating district. Commissioners appointed to ascertain the compensation to be paid for the property taken rendered a report which was confirmed. After an informal oral discussion between representatives of the board and of the railroad, the board made a written offer of $550,000. The award in this proceeding was $1,442,130 for property which the railroad and the trustee under the mortgage securing an issue of bonds claimed to be worth more than $4,000,000. The board's offer was far less than the amount awarded, but in the opinion of the court was so much closer to the actual value than to the defendants' demand that no justification could be found in the charge that the board did not act in good faith. The trier of the facts found that the offer was bona fide, and that finding was fully supported. After the board's attempt to agree with the railroad ended unsuccessfully, any effort to agree with the holder of the mortgage would have been futile, and, therefore, was not required. When the state takes this property and makes adequate provision for its location elsewhere, it does nothing to regulate or to cause an abandonment. With the questions of abandonment and possible direct interference with interstate commerce eliminated from the case, the court held that the right to acquire and take possession of the property is clear. [Board of Hudson River District vs. Fonda, Johnstown & Gloversville R.R., 164 N.E. 541.]

New York—*Affirmation by Court of Appeals of a Judgment in Favor of the Plaintiff in an Action for Personal Injuries.*

Plaintiff, while driving a wagon on Military Road, Buffalo, was injured in a collision with one of defendant's street cars. The issue on appeal was whether payments advanced to an injured party by an insurance carrier, after formal written notice that the injured party had elected to sue the negligent third party, are to be regarded as payments of compensation where no award of compensation had ever been made nor a hearing had before the State Industrial Commission. [Sifkowitz vs. the International Railway, 164 N. E. 585.]

Ohio—*Interstate Certificate to Operate Buses Was Properly Revoked Where Violations of Commission's Rule Continued After the Owner Had Been Warned.*

The court found it difficult to see upon what theory the commission revoked the certificate in the interstate operation, and refused to revoke the certificate relating to the intrastate operations, except on the theory that it was inclined to be lenient with the operator in the first instance and only decided to be firm with him upon proof of his later violations. It was the opinion of the court that the commission did not err in revoking the interstate certificate, since on Dec. 12, 1928 (Detroit-Cincinnati Coach Line, Inc., vs. Public Utilities Commission, 119 Ohio St. 324, 164 N.E. 356), it ruled that the commission has the power to revoke an interstate certificate for flagrant violations of valid rules and conditions. The court felt, however, that it would be an anomalous situation if it should hold that the commission might revoke an interstate certificate while at the same time leaving in full force and effect an intrastate certificate covering the same route and involving substantially the same violations. In consequence it reversed the commission's ruling on this order. [Wheeling Traction Co. vs. Public Utility Commission, 164 N.E. 523.]

Personal Items

A. Clint Spurr Honored in Wheeling

A. Clint Spurr, general manager of the Wheeling Traction Company, Wheeling, W. Va., was elected vice-president as well as general manager of the company and its subsidiary companies at a recent meeting of the board of directors. He was also given charge of the Wheeling Bridge Company. Mr. Spurr went to Wheeling as general manager in 1925 when he succeeded G. S. Wills, who left to take a similar post with another property in the East Liverpool district.

Early in his career Mr. Spurr entered the services of the Baltimore & Ohio Railroad with headquarters in Baltimore in the office of A. W. Thompson, vice-president. He remained with this outfit until the outbreak of the war. After his discharge from the Army, he became associated with Thomas Fitzgerald in consulting electric railway engineering work in Pittsburgh and remained with him for four years. When Mr. Fitzgerald became general manager and later vice-president of the Pittsburgh Railways, Mr. Spurr accepted the position of research manager for that company and worked indefatigably until his appointment as general manager at Wheeling.

Mr. Spurr was born in Valley City, N. D., in 1885. Later the family moved to Moundsville where he received his early education. Later he attended Linsly Institute for two years. He then entered Yale University where he received the degree of B.A. and LL.B.

◆

C. J. Darrah Succeeds W. C. Shuck at Toledo

C. J. Darrah, who has been in the transfer department of the Community Traction Company, Toledo, Ohio, for nearly two years, has been named chief clerk of the transportation department to succeed the late William C. Shuck, according to an announcement by C. H. Forsgard, general superintendent.

◆

J. E. Zimmermann Elected U.G.I. President

John E. Zimmermann was elected president of the United Gas Imrovement Company at a meeting of the board of directors on Feb. 27. Mr. Zimmermann has been chairman of the company's executive committee. He has agreed to assume the additional duties of the presidency "without obligation to continue the same for an indefinite period." Mr. Zimmermann will retain the chairmanship of the executive committee of the United Gas Improvement Company. He succeeds Arthur W. Thompson, to whom a six months' leave of absence was granted early in December and whose resignation was accepted last month. Mr. Thompson is now in Europe.

◆

C. J. Curtaz Advanced

Made active manager of the Boston, Revere Beach & Lynn Railroad, the service of which he entered as a boy

FULL recognition came to Charles J. Curtaz for his long period of able and faithful service with the Boston, Revere Beach & Lynn Railroad, when he was recently designated acting manager of the company, effective on March 1. In addition to that office he will serve as assistant treasurer and clerk of the corporation, the latter office, under Massachusetts laws, corresponding to that of secretary.

C. J. Curtaz

Mr. Curtaz went to work for the railway as a mere lad. To be exact he was only fourteen years of age. He had attended the Boston public schools, but the fact that circumstance dictated that he seek work did not whet for a moment his desire for formal schooling more extended than it had been possible for him to obtain. So he attended the evening high schools, meanwhile and ever since adding to the meager equipment with which he started out to make his own way.

From that time in July, 1898, when he entered the service of the railroad, Mr. Curtaz unassumingly carried not only one Message to Garcia, but literally hundreds of them, as he served successively as clerk, cashier and accountant until Aug. 16, 1920, at which time he was made clerk of the corporation and assistant to the treasurer. Three and a half years later, on Jan. 24, 1923, he was appointed treasurer, in which capacity he served until Nov. 15, 1927. This was the date on which Hemphill & Wells arranged to take over the line and began to mature plans for equipping the road for electric operation, work that was completed in very fast time, the installation being fully described in the JOURNAL for Dec. 8, 1928.

At the time the road passed to the new owners, Mr. Curtaz was appointed assistant treasurer, retaining the office of clerk of the corporation. The new management soon found that this "old-timer" was in full accord with its up-to-date ideas. Like others in similar cases, Mr. Curtaz simply had not had the opportunity to prove his larger worth. In an age in which it seems at times that the showy, spectacular individual too often succeeds in having himself accepted on the basis of what he appears to be rather than what he is, it is the instances of recognition of men like Mr. Curtaz, who perform their work modestly but with real facility and dispatch, that hearten men in all walks of life who have achieved a real celerity in performing their duties that at times seems to becloud their capacity.

◆

H. C. Truesdall Reappointed to Toledo Board

Henry C. Truesdall, vice-president Toledo Trust Company, has been reappointed by Mayor W. T. Jackson, of Toledo, Ohio, to the Board of Street Railway Control for the third term. He will serve six years.

Following Mr. Truesdall's appointment, the board reorganized and named W. W. Knight, chairman, and David H. Goodwillie, secretary. These three members have served together for the eight years that the Milner ordinance has been in effect and reappointment of Mr. Truesdall indicates that they will continue together for two more years. The problem of extension of the Milner grant will come up for settlement within the next two years, and it was deemed important to keep the original board intact.

◆

Woman Executive at Alton Resigns

Miss Katherine Wilson, assistant to the vice-president Illinois Terminal Railway, a position which carries the duties and responsibilities of a general manager, has resigned. She was stationed at Alton, Ill., and for many years had concealed her sex in her correspondence by using the initials K.E., instead of her full name.

Born in Alton, Miss Wilson joined the railway as a stenographer in 1899, and worked under H. H. Ferguson, vice-president. At that time the 6-mile railroad served only one industry. Successively she became chief clerk and car accountant, the highest position the small road could then offer her. As years passed Mr. Ferguson came more and more to pass operating responsibilities to Miss Wilson and she was recognized as the manager. The road expanded to Formosa and Edwardsville and Miss Wilson's duties increased.

Eight months ago the Illinois Power & Light Corporation purchased the 50-mile railroad and it was consolidated with the Illinois Traction System controlled by the same interests.

Both Vice-President Ferguson and Miss Wilson have announced their intention to retire from the organization.

◆

Walter C. Loy Takes on New Duties in Chicago

Walter C. Loy, assistant general manager Shore Line Motor Coach Company, Hammond, Ind., has resigned to become associated with the Union Motor Coach Terminal Company, Chicago, as assistant general manager. Mr. Loy has been identified with traffic work in steam, electric railroad and motor coach enterprises for more than 25 years, the last three of which have been with the Shore Line Motor Coach Company.

◆

Alba H. Warren With Houston Gas

Announcement has been made from the office of O. R. Seagraves, president, United Gas Company, parent company of the Houston Gas & Fuel Company, Houston, Tex., of the appointment of Alba H. Warren as vice-president and general manager of the latter company, succeeding W. A. Raymond.

Mr. Warren is leaving his present position as district manager of the Stone & Webster properties in Georgia and Florida, with headquarters at Savannah, Ga. He has been in the public utility business for 21 years. Among the positions he has held are the following: Manager Pensacola Electric Company at Pensacola, Fla., 1908-1913; manager Galveston Electric Company, 1913-1918; manager El Paso Electric Company, which did the lighting and railway business in El Paso, Juarez, Mexico, and surrounding communities, 1918-1925. In February, 1925, Mr. Warren was transferred to Savannah as manager for Stone & Webster of the Southeastern district.

◆

J. J. Pelley Heads New Haven

John J. Pelley, president of the Central of Georgia Railway, was elected president of the New York, New Haven & Hartford Railroad, succeeding the late E. J. Pearson. He assumed his new duties on March 1 with that road and its subsidiaries. After serving in many capacities in the railroad field, Mr. Pelley in 1917 was appointed general superintendent to the Illinois Central, Southern lines, and general superintendent of the northern lines in 1919.

He was promoted to be general manager of the Illinois Central in 1923 and the next year he was made vice-president in charge of operation. In the fall of 1926 Mr. Pelley was elected president of the Central of Georgia. Mr. Pelley was born at Anna, Ill., in 1878. He attended the University of Illinois.

C. H. Copley Leaves Missouri Road

C. H. Copley has moved to New Haven, Conn., but has not decided on any new assignment. He resigned his position as general superintendent Springfield Traction Company, Springfield, Mo., some months ago. Since 1894 Mr. Copley has been engaged in electric railway work, first as motorman for the Winchester Avenue Railroad, West Haven, Conn. Later he was general superintendent of the Bellows Falls & Saxtons River Street Railway in Vermont. Before his affiliation with the Springfield Traction Company in 1917 he had served as construction foreman for C. W. Blakeslee & Sons, New Haven, and as superintendent of the Norwalk and the Stamford divisions of the Connecticut Company in Norwalk.

◆

H. K. Bennett, formerly identified with safety work on the United Electric Railways, Providence, R. I., is serving as manager of the Providence council of the National Safety Council. Mr. Bennett resigned some months ago from the United Electric Railways, relinquishing the position as manager of the department of safety and publication.

W. H. Wright, secretary of the Georgia Power Company, Atlanta, Ga., has been appointed assistant to the president, according to an announcement made by Preston S. Arkwright, president. A native of Georgia, Mr. Wright entered the employ of the company in 1906 as secretary to H. M. Atkinson, chairman of the board of directors of the Georgia Railway & Power Company. These duties he held until 1916, when he was elected secretary of the company, the position he retained up to the present time.

Major Ewing E. Towles has resigned as assistant chief engineer for the Missouri Public Service Commission at Jefferson City, effective on March 1, to enter the operating end of the public utility field. He is a graduate of the Missouri University School of Engineering. He became assistant chief engineer for the commission in 1914, and was later granted a leave of absence to serve in the signal corps of the army during the World War.

W. Forbes, general manager of the Aberdeen Corporation Tramways, Scotland, has been unanimously recommended for appointment as general manager of the Cardiff Corporation Tramways in Wales. Mr. Forbes succeeds R. L. Horsfield, recently made general manager of the Leeds City Tramways. In his early years Mr. Forbes served with the once prominent firm of Westinghouse, Church, Kerr & Company, consulting and constructing engineers. This experience naturally has led to Mr. Forbes' maintaining a keen interest in American transportation practices.

J. P. Pulliam, vice-president of the Wisconsin Public Service Corporation, Milwaukee, has been elected a vice-president of the Wisconsin Securities Company. In addition to his new position he retains his former position as treasurer of the Wisconsin Securities Company.

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OBITUARY

Harry O. Butler

Harry O. Butler, superintendent of transportation, St. Louis Public Service Company and for 40 years an employee of the company and its predecessors, died on Feb. 11. He started his railway career as a conductor on the old Olive Street cable line in 1889 and in 1896 was made a supervisor for the old Union Depot Railroad, which was later merged with other companies to form the St. Louis Transit Company, the predecessor of the United Railways, and its successor, the present St. Louis Public Service Company. The Union Depot Railroad was operated by John Scullin and associates. In 1897 Mr. Butler was made superintendent of the Grand Avenue line and in 1903 was placed in charge of the Grand and Bellefontaine lines. He continued in that capacity until 1913 when he was promoted to assistant superintendent of transportation. He was made superintendent of transportation in 1923.

R. E. Gallaher

Raphael Eccleton Gallaher, president of the New York Insulated Wire Company, died on Feb. 10. Mr. Gallaher was a pioneer in the wire and cable industry. In 1884 he organized the New York Insulated Wire Company, which is now a member of the Wire and Cable Section of the National Electrical Manufacturers Association. He held the position of secretary of his company from the time it was organized until 1927, when he became president. Mr. Gallaher was 78 years of age.

W. C. Shuck

William C. Shuck, who had served as chief clerk of the transportation department of the Community Traction Company, Toledo, Ohio, since 1919, died at Mercy Hospital there on Feb. 18, following a stroke of apoplexy suffered two days before. He was prominent in Masonic affairs in Toledo. He had formerly been employed for 22 years at the Toledo State Hospital. Mr. Shuck was born in Cumberland, Md., in 1875.

Jonas J. Burns, who aided in promoting the first electric railway in Goshen, Ind., and also the railway line, now part of the New York Central system between Goshen and Battle Creek, Mich., died recently. He was 78 years old.

J. W. Weitnauer, master mechanic Springfield Traction Company, Springfield, Mo., died recently. He had been with the company for 30 years, advancing from the position of motorman. Mr. Weitnauer was 54 years old.

Equipment Orders Pending

Detroit may order 100 additional cars. $5,492,173 railway improvements to be made in Milwaukee. Montreal may place large car order. Public Service orders 288 buses

WITH THE delivery of 100 new street cars now commencing, the general manager of the Detroit Street Railway, Detroit, Mich., has been instructed to make a survey to determine whether 100 additional cars should not be ordered at once. This action was taken so that the department may not find itself with insufficient equipment when the employment conditions show further improvement during the summer months.

Delivery of the cars ordered last November from the Perley Thomas Car Company, High Point, N. C., has commenced and will continue at the rate of six or eight per week until the contract has expired. It is believed that if new cars are ordered they should be equipped with three doors in the center instead of two, thus facilitating loading and unloading.

Milwaukee Improvements

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., and its associated utilities in Winconsin and upper Michigan are planning to invest $17,339,211 in expanding and improving its public service facilities this year. The program is the most extensive the company has ever undertaken, the total budget exceeding that of 1928 by $3,356,567. Substantially the largest part of the expansion is planned for the Milwaukee area. The budget is divided among the various properties as follows: the Milwaukee Electric Railway & Light Company and the Wisconsin Electric Power Company, $12,668,486; The Wisconsin Gas & Electric Company $2,999,800; and the Wisconsin-Michigan Power Company, $1,670,938.

A total of $5,492,193 is provided for the improvement of the Milwaukee Electric Railway & Light Company's railway system. The provision of $1,250,000 for the prosecution of work on the west side rapid transit and subway projects are major single items in the program. Other items include $150,000 for the company's apportionment of the cost of the west side steam railroad grade separations and $127,000 for the construction of tracks on the new Sixteenth Street viaduct. Expansion of the boiler capacity, and auxiliary equipment at the Lakeside plant is to cost approximately $1,500,000. The Wisconsin Gas & Electric Company plans further expansion of its gas manufacturing and distributing system at a total cost of $1,678,191. The Wisconsin-Michigan Power Company will undertake extensive plant improvements and expansion of its transmission line facilities.

Borough President Byrne, of Brooklyn, has proposed that the Board of Estimate seek an agreement with the South Brooklyn Railway, Brooklyn, N. Y., for the transfer of its tracks from the private right-of-way along Shell Road to the middle of the street. By laying the tracks on both sides of the row of elevated pillars, which now fall in the middle of Shell Road, it is pointed out that the tracks across Shell Road from Gravesend Avenue would be less dangerous to traffic, and by using the Mall for the tracks, the city will not have to attempt the difficult task of compelling the railway to construct its present right-of-way to the legal grade at the intersections of the eastbound streets that have been mapped out.

The South Brooklyn Railway's private right-of-way crosses a number of eastbound streets which have been mapped out but which have not as yet been acquired by the city of New York. Where this right-of-way crosses these various streets, it is below grade and it is believed it will be a very difficult matter for the city to compel the railroad to conform its right-of-way to the legal grade at these intersections. It is believed that it cannot be done without the action of both the Board of Estimate and the State Transit Commission. A ruling by the latter body is said probably to result in a number of dangerous street crossings.

It is pointed out that the way to avoid such grade crossings is to transfer the railroad out of its private right-of-way to the center of Shell Road and to improve the highway with roadways on each side of the central Mall. A public hearing on the measure was set for March 12 by the Assembly judiciary committee.

Public Service Buys Buses

The Public Service Co-ordinated Transport, Newark, N. J., has just placed an order for 288 additional Yellow chassis and complete coaches, it was announced here today by H E. Listman, vice-president General Motors Truck Company. The order calls for 33 type Y, 29-passenger coaches; 93 Z-240 gas-mechanical chassis; 161 Z-240 gas-electric chasis and 1 type W.

Public Service Co-ordinated Transport is the largest operator of motor coaches in the United States.

The order just reported brings its total fleet to more than 2,000 coaches.

Montreal to Order Cars

It is understood that Montreal Tramways, Montreal, Que., will shortly place an order for 50 cars of modern design to replace equipment of an inferior type. The management also is said to be considering the placing of an additional order for a like number.

At an average cost per car of $20,000, this will mean an expenditure of about $1,000,000 by Montreal Tramways and possibly twice that amount if the management decides to go ahead with the larger program.

It has not been decided what manufacturer will get the initial order. In the last two or three years Montreal Tramways has spent large sums of money in maintaining its rolling stock in a high degree of efficiency and has been active in adopting the latest designs.

Construction in Oakland

Preparatory work for the widening of Foothill Boulevard is under way by the Key System Transit Company, Oakland, Cal. The company is setting back all the trolley guide wire poles on Foothill Boulevard from 35th Avenue to 42nd Avenue. This work precedes the paving work to be undertaken by the city and track reconstruction and paving work to be done by the railway.

The Key System Transit Company is also developing a number of more comfortable noiseless cars. A total of six cars have already been reconstructed and are now in operation for experimental purposes. Noise deadening, shock absorbing shims have been placed between the trucks of the cars and the car bodies and at the base of the air compressors. Deep cushioned individual seats have been installed and a new window sash arrangement affords spacious windows and greater vision for the passengers. A new carpet, buzzer system, and modern illumination are features on these cars.

There was a total of 105,705 lineal feet of track rebuilt during the year 1928 by the Kansas City Public Service Company, Kansas City, Mo. This exceeded the construction during the previous year which amounted to 102,231 lineal feet. During the year special work was installed at 30 different locations. In the rehabilitation of tangent track there was $303,373.75 expended for labor; for material, $557,065.35; making a total of $860,439.10. The installation of special work called for labor amounting to $88,608.71 and material charges of $237,974.08. the total expenditure for rehabilitation of tangent track and special work was $1,187,021.89.

The Chicago & Joliet Electric Railway, Joliet, Ill., will relocate a number of its car tracks and make several extensions to its lines during the coming spring. Bond elections are proposed in San Francisco to provide $1,000,000 for the electrification of the old California cable line in that city. The British Columbia Electric Railway Vancouver, B. C., has let a contract for a $40,000 power distribution plant, having a capacity of 20,000 kw. The Ottawa Electric Railway, Ottawa, Ont., has ordered one 5/8-in. electric valve refacer.

The Louisville Railway, Louisville, Ky., has recently ordered 10,000 white oak ties; 15 miles of No. 00 copper trolley wire; 50,000 ft. of soft steel strand and 500 clinch ears. This company has also ordered miscellaneous car equipment and supplies amounting to approximately $10,000.

Britain Completing Large Suburban Electrification

The electrification on the central section of the Southern Railway of England is now nearly complete. On March 3 and 4, new electric train service will be brought into operation for the first time, and trains previously worked on the overhead wire system will be worked on the third-rail or direct current system, the standard method of Southern Railway electrification.

From this time the whole of the railway's electrified tracks will be worked by the third-rail system. "Overhead" trains will continue to run for a while on certain of these routes, but those will gradually disappear as the new rolling stock becomes available. With the opening of this, therefore, the whole of the railway's suburban electrification scheme of 875 miles, as authorized by its board of directors, will be complete.

The first stage under Southern Railway administration was opened in 1925, and each year there have been extensions and conversions, until the installation has reached a cost of £11,000,000. The service has been entirely rearranged and increased in some cases to as much as 200 per cent more than that previously given by steam. New signalling has been installed; stations have been rebuilt and platforms remodelled on a large scale, and further extensions of the electrified area are being considered by the company's experts.

Apart from the electrification of steam lines and the conversion to third-rail working, London business people will benefit by the opening of the railway's new through services from Wimbledon, Tooting, Beckenham, etc., to the city.

The introduction of these new and converted services has necessitated provision of 42 three-coach units and 22 two-coach trailer units, with seating accommodation for 2,352 first-class and 11,740 third-class passengers.

The electrification and conversion of the lines has necessitated many structural alterations and the lengthening of platforms at several stations. The new station at Epsom will be brought into use to serve both the Waterloo and Victoria trains.

New permanent way connections have been provided at the terminus at Victoria. The lines between Kent House Junction and Beckenham Junction have been widened to enable the new services from Beckenham Junction to Victoria to work into the new bay platform at Beckenham Junction without interfering with the main lines.

METAL, COAL AND MATERIAL PRICES F. O. B. REFINERY

	Feb. 26, 1929
Metals—New York	
Copper electrolytic, cents per lb.	18.45
Copper wire, cents per lb.	20 875
Lead, cents per lb.	7.10
Zinc, cents per lb.	6.7
Tin, Straits, cents per lb.	49.
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.425
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.80
Franklin, Ill., screenings, Chicago, net tons	1.35
Central, Ill., screenings, Chicago, net tons	1.05
Kansas screenings, Kansas City, net tons	1 70
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000ft.	$5 90
Weatherproof wire base, N.Y., cents per lb.	21.375
Cement, Chicago net prices, without bags	2 05
Linseed oil (5-bbl. lots) N. Y., cents per lb.	10 6
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.5
Turpentine (bbl. lots), N. Y., per gal	.6225

Booklet Issued on Simplified Coated Abrasives

Instead of 8,000 varieties of coated abrasive products, spot stocks will now be limited to 1,976, corresponding to an elimination of 75.3 per cent, the Department of Commerce announces through its division of simplified practice. According to the department, the printed government pamphlet is now available for purchase, through the Superintendent of Documents, Government Printing Office, Washington, D. C.

For years the quantity of sizes and varieties of coated abrasive products has been increasing at a rapid rate. Many thousands of varieties have been stocked and cataloged by the industry when actually only a certain portion of them have enjoyed a satisfactory turnover. This becomes a matter of considerable importance in view of the fact that the estimated annual output of the industry amounts to about $16,000,000. This over-diversification in manufacture led to the development of Simplified Practice Recommendation No. 89, Coated Abrasive Products. The industry fixed Jan. 1, 1929, for absorption of the obsolete varieties. A standing committee of the industry has been appointed which will have in its charge the periodical revision of this simplified practice program.

Mazda Lamp Prices Reduced

Mazda lamp prices were again reduced on March 1, 1929, on the 50 and 60-watt lamps of the standard line of inside frosted lamps, Gerard Swope, president General Electric Company, has announced. Price reductions were also made on all colored lamps except flame tints.

This is the twelfth time that Mazda lamp prices have been reduced since 1920. Present reduction of approximately 10 per cent brings the prices of these lamps to almost one-half of their 1914 prices.

The March 1 price reductions are as follows:

Lamp Size	Old Price Cents	New Price Cents
50-watt (A)	22	20
60-watt (A)	22	20
25-watt (colored)	30	25
40-watt (colored)	30	25

Building Construction Declines

After the value of construction contracts had reached a new high record for all time during 1928 at $6,628,286,000, which is 5 per cent above the total for 1927 and 10 per cent above that for 1925, the January building reports were received with mild disappointment in some circles. Construction contracts awarded in that month in 37 states east of the Rocky Mountains, according to the F. W. Dodge Corporation, amounted to $409,967,900, which is 4 per cent below the value of those awarded in January, 1928. The heaviest decline in contracts awarded in January was in the district composed of New York State and northern New Jersey, where there was a drop of 22 per cent from contracts awarded in the corresponding month in 1928. The total for the Pittsburgh district, on the other hand, was double that of January last year; while the Northwest district reported the second largest total for any January on record.

ADVERTISING LITERATURE

WAGNER ELECTRIC CORPORATION, St. Louis, Mo., has issued a new bulletin No. 158 on small vertical motors, covering all types, in ratings of ⅛ to 1½ hp. As illustrated by diagrams in this bulletin, a unique feature of these motors is that they all have the same flange or lug dimensions, making it possible for manufacturers and users of small motor-driven machinery to interchange motors of different types and ratings on the same mounting dimension.

CUTLER-HAMMER MANUFACTURING COMPANY, Milwaukee, Wis., has issued a booklet giving a photographic presentation of "Modern Metal Handling Methods" by using "Red Top" lifting magnets. Photographs are used almost entirely to show the application of magnets to the varied kinds of work in foundries, junk yards, steel plants and miscellaneous industries.

WAUKESHA MOTOR COMPANY, Waukesha, Wis., has issued a new book entitled "What's New With Waukesha," which describes new engines developed during the past year by that company. A large stationary engine, several sizes of transportation engines, and a number of completely equipped power plants are described.

It's not the design that makes a modern car—*it's the equipment*

—Especially the safety equipment. That is why so many of the new cars are equipped with handbrakes that operate on the most modern principle of—

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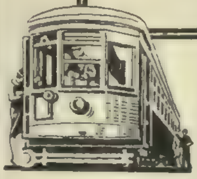

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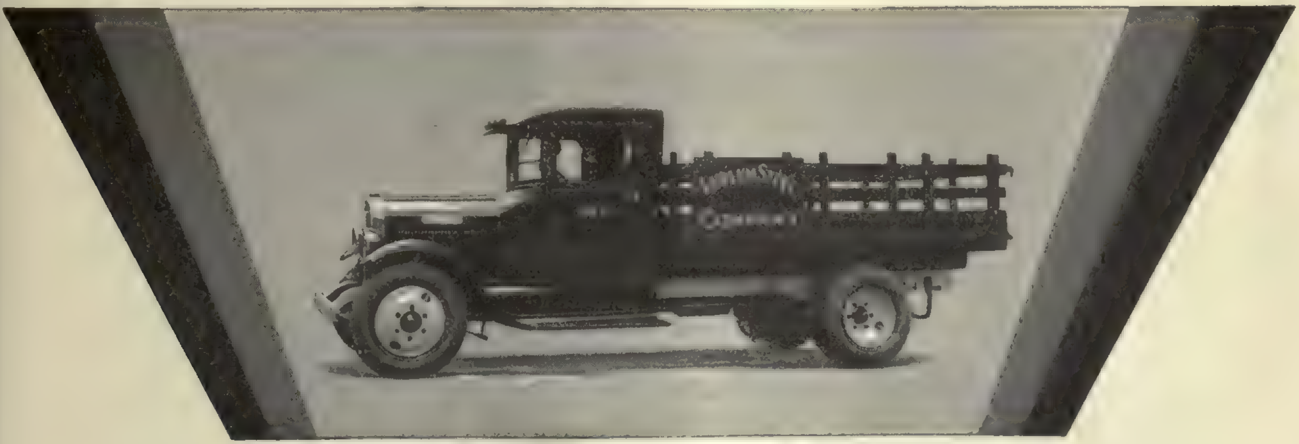

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(1) Data on subjects which come up in everyday electric railway practice for constant use by the operating, constructing and designing engineer.
(2) Material of service to the non-technical manager or operator.
(3) Reference material on electric railway practice for those who are specializing in other or allied fields.

Information every electric railway man needs—the latest and best methods—changes in practice and theory—that's the new Richey.

See your copy FREE
Mail just this coupon

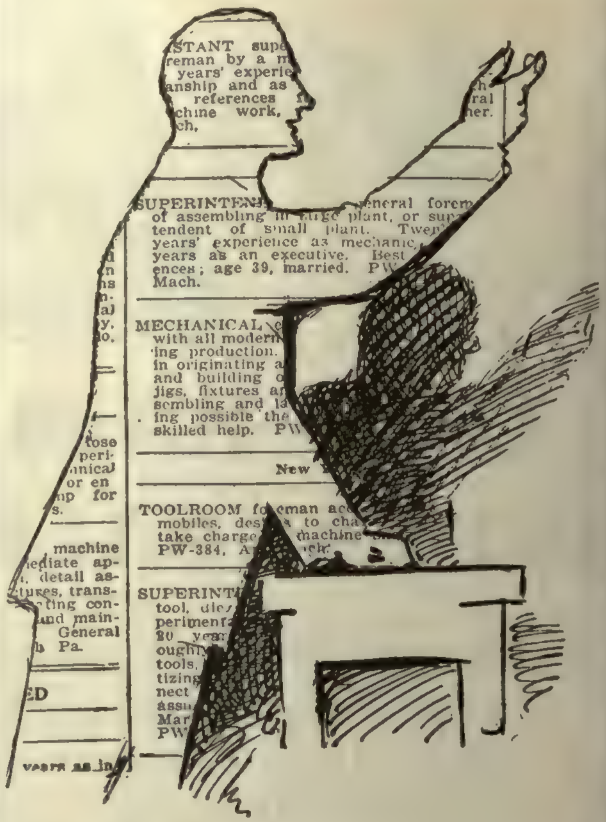
McGRAW-HILL
FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y.

You may send me on 10 days' aproval **Richey's Electric Railway Handbook.** $4.00 net. I agree to pay for the book or return it postpaid within 10 days of receipt.

Signed ....
Address ....
Official Position ....
Name of Company ....

(Books sent on approval to retail purchasers in the U. S. and Canada only.) E. 3-2-29



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For Every Business Want
"Think SEARCHLIGHT *First"*

0144

Our Aim

Safety:

C.E.M.F. RELAYS: Prevent doors from opening while the car is in motion
CONTROL RELAYS: Prevent the car from starting while doors are still open
ENGINE BY-PASS VALVE: Prevents doors slamming if stopped while closing
SAFETY REVERSING DOORS: Open automatically if touched while closing
MOTORMAN SIGNAL LIGHTS: Indicate to motorman when all doors are closed
WINDOW SILL HEATERS: Permit clear vision in cold weather by keeping the motorman's window free from frost, snow and sleet
ELECTRIC HEATERS: With open and enclosed coil element, have carefully designed cases which positively eliminate accidental contact
SAFETY SWITCHES: Fully enclosed, offer absolute protection to the operators

Comfort:

THERMOSTATS: Maintain an even car temperature under all conditions
ELECTRIC HEATERS: Furnish an even and comfortable heat for passengers
AUTOMATIC VENTILATORS: Introduce fresh air and exhaust vitiated air

Economy:

THERMOSTATS: Prevent unnecessary waste of current by the electric heaters
MOTOR RESISTOR HEATERS: Utilize the heat dissipated by resistance grids and automatically remove regular heaters from the peak load
MULTIPLE UNIT DOOR CONTROL: Eliminates many unnecessary train men
AUTOMATIC TREADLE DOORS: Permit the use of one man cars and buses without loss of efficiency in handling passengers, or in maintaining schedules

Speed:

PNEUMATIC DOOR ENGINES: Open doors when cars come to a stop, and close them when the power is applied, all automatically
AUTOMATIC TREADLE OPERATED DOORS: Speed up the unloading of passengers and permit the cars to maintain better schedules and faster service

These represent our four contributions to better modern transportation

CONSOLIDATED CAR-HEATING COMPANY, INC.
New York—Albany—Chicago

OHIO ~

gets the first Fleet of

Studebaker Straight Eight Busses

Splendid Performance on Stiff Grades Proved Superiority of Straight Eights

SEVEN STUDEBAKER Straight Eight Busses, five inter-city and two city type, were put in service on January 25th by the Southern Ohio Public Service Company and its subsidiaries operating between Columbus, Newark and Zanesville, and within the city of Zanesville.

Mr. R. L. Jacobs, General Superintendent of the company, in giving his reasons for this purchase, said, "We are standardizing on Studebakers because our records prove them to be very satisfactory and economical. We operated 1,110,000 miles of inter-city service last year with 14 Studebakers and 6 busses of other makes. The Studebakers covered practically two-thirds the total distance at an average cost of 13 cents a mile. This includes everything but depreciation. And it represents a considerable saving over the operating cost of other equipment.

"Because Studebaker Busses are from 3000 to 5000 pounds lighter than any heavy type bus of equal seating capacity, they cost less to operate. The first cost is about one-half that of the heavier type, therefore the depreciation is less. We also get mighty fine tire mileages on Studebakers. We get a tire average of 30,000 miles on our Studebakers as against 20,000 miles on the heavier busses.

"But what interested us most was the really remarkable performance of the new Studebaker straight eight bus. In traffic it handles with the ease of a passenger car, and its reserve power makes it possible to maintain our close schedules over the Columbus-Zanesville route, half of which is over grades ranging up to 7 degrees. Even with a capacity load, it glides up the steep hills easily at any desired speed.

"We feel that Studebaker offers more for our bus dollar than any other manufacturer—that is why we are sold on Studebakers."

and from other States— Following the announcement of Studebaker's new Straight Eight bus which is offered in 2 wheelbases and 3 models, orders far exceeded the first month's production. Experienced operators—many of them already Studebaker owners, bought Straight Eights. Today these new units are operating in Massachusetts, Wisconsin, Kentucky, Ohio, Texas, Oklahoma Kansas, Pennsylvania, Indiana, Tennessee, Missouri and in Canada.

STUDEBAKERS are

hese seven Studebaker straight eight busses delivered to the Southern Ohio Public Service Company brings their fleet to 21 Studebaker units.

The experience of the Southern Ohio Public Service Company with Studebaker equipment parallels that of nearly 2000 other bus operators who are using Studebakers. These operators have learned by experience that their Studebakers are profit makers because of these four fundamental facts:

1. Studebaker busses are lower priced than any other busses of comparable quality and capacity.

2. The operating cost of Studebakers is lower because the chassis and bodies are correctly designed—all excess weight is eliminated, yet there is no compromise with safety or stability.

3. Due to the use of husky units and clean cut design, Studebaker busses have an unusually low maintenance expense. Proof: 20,000 miles service on each of the 24 Studebakers operated by The Detroit Motor Coach Co., during the last quarter of 1928 showed an average repair cost per bus of $12.24, or less than 7/100 of a cent per bus mile.

4. Lower depreciation is also an important item in Studebaker equipment. The tremendous excess mileage built into Studebaker busses, plus their low initial cost, has enabled bus operators to charge off their Studebakers at a very low rate per mile. When this balances the purchase price, many thousands of profit-producing miles are still left in these busses.

Prices

Studebaker Straight Eight Bus Models and Prices

Model 77

158-inch Straight Eight Junior Chassis

hassis only, single or dual rear wheels	$2585

Model 88

184-inch Straight Eight Special Chassis

hassis only, single or dual rear wheels	$2985
2-Passenger Seminole Observation Parlor Car	$6595

Model 99

184-inch Straight Eight Heavy Duty Chassis

hassis only, single rear wheels	$3385
hassis only, dual rear wheels	$3485
1-Passenger Street Car Bus	$6095

ll prices F. O. B. Factory. Purchase can be arranged on Studebaker's liberal budget payment plan.

first cost
operating cost
maintenance
depreciation
Lower

THE STUDEBAKER CORPORATION OF AMERICA,
Dept. B South Bend, Ind.

Please send complete information on Studebaker Straight Eight Busses, without obligation.

We have __________ busses at present. Check below the Studebaker Bus about which you desire information.

Body Model: Seminole ______ Street Car ______

Name ____________________

Address ____________________

City __________ State __________

B-3-29

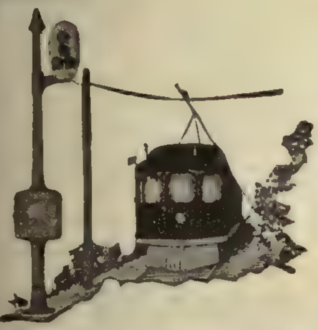
Profit Makers

HOMAN
& COMPANY
MAIN ST.
CARS STOP HERE
NO PARKING
SA
ELECTRIC RAILWAY SERVICE AND COLLIER SERVICE BRING THE BUYERS TO MARKET

Car Card Advertising
Almost Everywhere!

BARRON G. COLLIER
INC.
NEW YORK CITY

AIMCo



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for our Publication on
SAFETY
and
EFFICIENCY
in Electric Railway
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Crossing Bells

EST. 1855 AIMCo INC. 1918
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Insulating
Machinery
Company
REG. U.S. PAT. OFF.

A

521 Huntingdon St., Philadelphia, Pa.

Godward Gas Generator

You can
now use
Fuel Oil
in buses with
the Godward Gas
Generator

National Railway Appliance Co.
420 Lexington Ave., New York
BRANCH OFFICES
Munsey Bldg., Washington, D. C. 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Building, Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Calif.
Lister-Reese, Inc., 401 S. Brand Blvd., Glendale, Calif.

COLUMBIA

Railway and Utility Supplies

Castings—Grey Iron,
Brass and Aluminum

Forgings
Special Machinery
and Patterns

Machine and Sheet
Metal Work

Armature and
Field Coils.

The Columbia Machine Works *and M. I. Co.*
265 Chestnut St., corner Atlantic Ave.,
Brooklyn, New York

Special TRACKWORK

It is the super-enduring qualities of Tisco Manganese Steel—the original in the trackwork field—and workmanship born of painstaking care, that keep Wharton trackwork in the vanguard.

WM. WHARTON JR. & CO., INC.
EASTON, PENNA.

Kalamazoo Trolley Wheels

The value of Kalamazoo Trolley Wheels and Harps has been demonstrated by large and small electric railway systems for a period of thirty years. Being exclusive manufacturers, with no other lines to maintain, it is through the high quality of our product that we merit the large patronage we now enjoy. With the assurance that you pay no premium for quality we will appreciate your inquiries.

THE STAR BRASS WORKS
KALAMAZOO, MICH., U. S. A.

The DIFFERENTIAL CAR

Standard on
60 Railways for

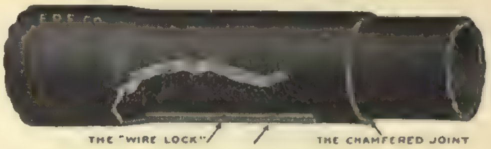
Track Maintenance
Track Construction
Ash Disposal
Coal Hauling
Concrete Materials
Waste Handling
Excavated Materials
Hauling Cross Ties
Snow Disposal

Use These Labor Savers

Differential Crane Car
Clark Concrete Breaker
Differential 3-way Auto Truck Body
Differential Car Wheel Truck and Tractor

THE DIFFERENTIAL STEEL CAR CO., Findlay, O.

ELRECO TUBULAR POLES



COMBINE

Lowest Cost	Lightest Weight
Least Maintenance	Greatest Adaptability

Catalog complete with engineering data sent on request.

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New York City, 30 Church Street

Bankers and Engineers

Ford, Bacon & Davis
Incorporated
Engineers
39 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
Design and Construction
Examinations Reports Appraisals
Industrial and Public Service Properties
NEW YORK BOSTON CHICAGO

SANDERSON & PORTER
ENGINEERS
PUBLIC UTILITIES & INDUSTRIALS
Design Construction Management
Examinations Reports Valuations
CHICAGO NEW YORK SAN FRANCISCO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS - APPRAISALS - RATES - OPERATION - SERVICE

STEVENS & WOOD
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Transportation Examinations and Reports

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Financial Reports, Traffic Surveys
and Equipment Maintenance
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1004 Citizens National Bank Bldg.
Phone: Hanover: 2142
NEW YORK
49 Wall Street

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
50 East 42nd St., New York City

E. H. FAILE & CO.
Designers of
Garages— Service Buildings— Terminals
441 LEXINGTON AVE. NEW YORK

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Engineers — Constructors
Steam and Hydro-Electric Power Plants, Gas Plants,
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Buildings and Industrial Plants.
43 Exchange Place New York

THE BEELER ORGANIZATION
Transportation, Traffic, Operating Surveys
Better Service—Financial Reports
Appraisals—Management
52 Vanderbilt Ave. New York

ENGELHARDT W. HOLST
Consulting Engineers
Appraisals Reports Rates Service Investigation
Studies on Financial and Physical Rehabilitation
Reorganization Operation Management
683 Atlantic Ave., BOSTON, MASS.

BYLLESBY
ENGINEERING AND
MANAGEMENT CORPORATION
231 S. La Salle Street, Chicago
New York Pittsburgh San Francisco

McCLELLAN & JUNKERSFELD
Incorporated
ENGINEERING AND CONSTRUCTION
Examinations—Reports—Valuations
Transportation Problems—Power Developments
68 TRINITY PLACE NEW YORK

WALTER JACKSON
Consultant on Fares and Motor Buses
The Weekly and Sunday Pass—Differential
Fares—Ride Selling
Holbrook Hall 5-W-3
160 Gramatan Ave., Mt. Vernon, N. Y.

KELKER, DeLEUW & CO.
CONSULTING ENGINEERS
REPORTS ON
Operating Problems Valuations Traffic Surveys
111 W. Washington Street, Chicago, Ill.

THE P. EDWARD WISH SERVICE
50 Church St. NEW YORK
Street Railway Inspection DETECTIVES
131 State St. BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 8 cents a word, minimum charge $2.00.

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Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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1 to 3 inches	$4.50 an inch
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Other spaces and contract rates on request.

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B.J.

POSITIONS WANTED

ENGINEER—Ways and structures; 9 years' experience with street railway and interurban property. Clean, successful record, high-grade references, seeking position with future. PW-161, Electric Railway Journal, Tenth Ave. at 36th St., New York.

SUPERINTENDENT transportation, broad experience, established successful record city, interurban railways, buses. Will accept position of assistant with future. Salary and location secondary importance. Fine references. PW-162, Electric Railway Journal, Tenth Ave. at 36th St., New York.

POSITIONS VACANT

MANAGER

Experienced street railway man wanted on eastern property operating 75 cars. Must be familiar with all phases of street railway work and successful in public relations. Technical education desirable. Good opportunity for advancement. Apply giving details and references.

PV-163, Electric Railway Journal
Tenth Ave. at 36th St., New York City.

OFFICIAL PROPOSAL

Bids: March 14.

Tracklaying Broad Street Subway

DEPARTMENT OF CITY TRANSIT, CITY OF PHILADELPHIA, 13TH FLOOR, CITY HALL ANNEX

Philadelphia, Pa., Feb. 20, 1929.

Sealed proposals, addressed to the undersigned, at the office above mentioned, will be received until 12 o'clock noon (Eastern Standard Time), on Thursday, March 14, 1929, and publicly opened immediately thereafter, for:

CONTRACT NO. 213—TRACKLAYING SOUTH STREET TO NORTH OF GIRARD AVENUE.

Specifications and plans may be seen at the office of the Department, on the 14th floor, City Hall Annex, and copies of same with blank forms for proposals, will be supplied to intending bidders upon application. A deposit of Fifty (50) dollars will be required for the specifications and plans. This deposit will be refunded upon return of the specifications and plans in good condition.

Bidders must be skilled and regularly engaged in the class of work for which they are competing.

No bid will be considered unless accompanied by a certified check on a responsible bank or trust company in favor of the City of Philadelphia, to the amount of five (5) per centum of the sum of such bid, in accordance with the provisions of an ordinance approved March 21, 1928, and reprinted in full in the specifications.

The Director reserves the right to reject any or all bids, as he may deem best for the interest of the City of Philadelphia.

C. E. MYERS, Director.

Clearance Sale of All Used Busses

If you are considering the purchase of an absolutely slightly used or rebuilt bus, it will be well worth your time to investigate our stock.

4—Model 54, 6-cyl. White parlor cars, 28-passenger, slightly used, mileage less than 10,000 miles.

3—Rebuilt Model 50-B, 4-cyl. White parlor cars, 26-passenger.

1—Model 53 demonstrator, 4-cyl. White parlor car, 16 passenger.

Write for full particulars

THE WHITE CO.
2520 S. Wabash Ave., Chicago, Ill.

FOR SALE

Center Entrance Trailers

5—Kuhlman Car Co., mounted on Brill 67-F trucks with 24-in. steel wheels; equipped with G. E. air brakes. Seating capacity 58. Length over-all 47 ft. Very good condition. Low price for quick sale.

Erie Railways Co., 231 State St., Erie, Pa.

WANTED

WANTED

50 Ton Locomotive

for 600 or 600-1,200 volt. Quote price and equipment in first letter. Must be completely assembled.

W-165, Electric Railway Journal
7 So. Dearborn St., Chicago, Ill.

Satisfactory Results

An advertiser writes: "We wish to take this opportunity of writing you in connection with the satisfactory results that were produced by our advertising in your 'Searchlight Department.'

"If at any time in the future we have any advertising to place, that comes within the lines of your subscribers, you may be assured that our Advertising Department will give first consideration to your magazine, due to the results that have already been obtained by us."

You, too, can use "Searchlight" Advertising in your business *profitably.* Employment, equipment for sale or wanted, business opportunities, etc.

Address

Searchlight Department
Tenth Ave. at 36th St., New York City.

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Advertising, Street Car
Collier, Inc., Barron G.

Air Brakes
General Electric Co.
Westinghouse Air Brake Co.

Anchors, Guy
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Cincinnati Car Co.
Standard Steel Works Co.
Westinghouse E. & M. Co.

Axles (Front & Rear) Motor Truck & Passenger Car
Timken-Detroit Axle Co.

Axles, Trailer & Motor Bus
Timken-Detroit Axle Co.

Babbitting Devices
Columbia Machine Works

Badges and Buttons
Elec. Service Supplies Co.
International Register Co.

Batteries, Dry
Nichols-Lintern Co.

Bearings, Anti-Friction
Timken Roller Bearing Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Westinghouse E. & M. Co.

Bearings, Center & Roller Side
Columbia Machine Works
Stucki Co., A.

Bearings, Roller
Timken Roller Bearing Co.

Bearings, Thrust
Timken Roller Bearing Co.

Bells and Buzzers
Consolidated Car Htg. Co.

Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Elec. Service Supplies Co.

Benders, Rail
Railway Track-work Co.

Bodies, Bus
Brill Co., The J. G.

Boiler, Tubes
National Tube Co.

Bolts, Case Hardened
American Steel Foundries
Bemis Car Truck Co.

Bond Testers
Electric Service Supplies Co.

Bonding Apparatus
Elec. Service Supplies Co.
Railway Track-work Co.
Una Welding & Bonding Co.

Bonds, Rail
Elec. Service Supplies Co.
General Electric Co.
Railway Track-work Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Books
McGraw-Hill Book Co.

Brackets & Cross Arms (See also Poles, Ties, Posts, etc.)
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.

Brake Adjusters
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
American Brake Shoe & Foundry Co.
Bemis Car Truck Co.
Brill Co., The J. G.
Wheel Truing Brk. Shoe Co.

Brakes—Bk. Systems & Parts
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
General Electric Co.
National Brake Co.
Westinghouse Tr. Br. Co.

Brakes, Magnetic Rail
Cincinnati Car Co.

Brushes, Carbon
General Electric Co.
Westinghouse E. & M. Co.

Brushholders
Columbia Machine Works
General Electric Co.

Buses
General Electric Co.
Studebaker Corp. of America

Buses, Motor
General Motors Truck Co.

Bushings, Case Hardened & Manganese
American Steel Foundries
Brill Co., The J. G.
Bemis Car Truck Co.
Cincinnati Car Co.
Columbia Machine Works

Cables, (See Wires & Cables

Cambric Tapes, Yellow and Black Varnish
General Electric Co.

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heat. Co.
Westinghouse E. & M. Co.

Car Steps, Safety
Cincinnati Car Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Carbon Brushes (See Brushes, Carbon)

Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.

Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Cars, Gas, Rail
Brill Co., The J. G.

Cars, Passenger, Freight, Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Kuhlman Car Co., G. C.
Wason Mfg. Co.

Cars, Self-Propelled
Brill Co., The J. G.

Castings, Brass Composition or Copper
Cincinnati Car Co.
Columbia Machine Works

Castings, Gray Iron & Steel
American Brake Shoe & Foundry Co.
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works
Standard Steel Works Co.

Castings, Malleable & Brass
American Brake Shoe & Foundry Co.
Bemis Car Truck Co.
Columbia Machine Works
Timken Roller Bearing Co.

Catchers and Retrievers, Trolley
Earll, C. I.
Elec. Service Supplies Co.

Ceiling Car
Pantasote Co., Inc.

Chairs, Parlor Car
Heywood-Wakefield Co.

Change Carriers
Columbia Machine Works
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Change Trays
Cleveland Fare Box Co.
Electric Service Supplies Co.

Circuit-Breakers
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers, Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
Cincinnati Car Co.

Clutches
Long Mfg. Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Columbia Machine Works
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Coils, Armature and Field
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.
International Register Co.
Johnson Fare Box Co.

Coin Changers
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.
Johnson Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Columbia Machine Works
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Commutators or Parts
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Compressors, Air
General Electric Co.
Westinghouse Tr. Br. Co.

Condensers
Westinghouse E. & M. Co.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Heat. Co.
Elec. Service Supplies Co.

Controllers or Parts
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.

Cord, Bell, Trolley, Register, etc.
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.
Roebling's Sons Co., John A.

Cord Connectors & Couplers
Elec. Service Supplies Co.

Couplers, Car
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
Westinghouse Tr. Br. Co.

Cowl Ventilators
Nichols-Lintern Co.

Cranes, Hoists and Lifts
Electric Service Supplies Co.

Cross Arms (See Brackets)

Crossings
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossing Foundations
International Steel Tie Co.

Crossings, Frog and Switch
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossing Signals. (See Signal Systems, Highway Crossing)

Crossings, Track (See Track, Special Work)

Crossings, Trolley
General Electric Co.
Westinghouse E. & M. Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.
Pantasote Co., Inc.

Cutting Apparatus
General Electric Co.
Railway Track Work Co.

Dealer's Machinery & Second Hand Equipment
Erie Railway Co.
White Co., The

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
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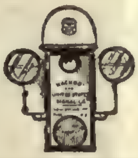

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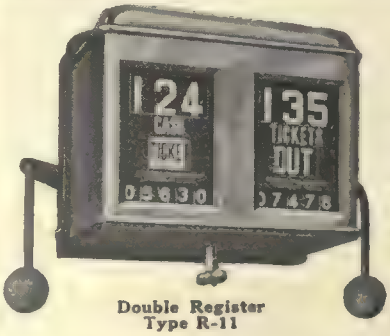

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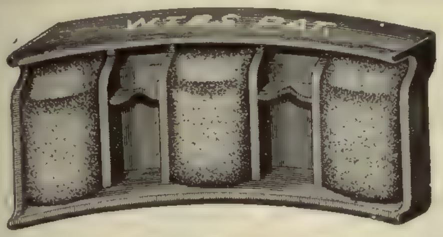

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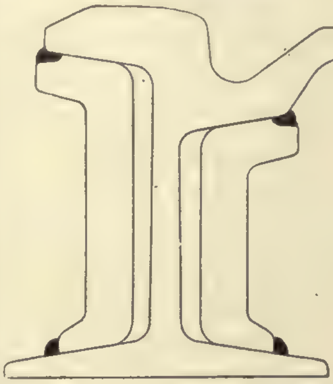

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Okonite Co.

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Star Brass Works

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Tubing, Steel
National Tube Co.
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General Electric Co.
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Welded Rail Joints
Lorain Steel Co.
Metal & Thermit Corp.
Railway Trackwork Co.
Una Welding & Bonding Co.

Welders, Portable Electric
General Electric Co.
Railway Track-work Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welders, Rail Joint
General Electric Co.
Railway Track-work Co.

Welding Processes and Apparatus
Metal & Thermit Corp.
Railway Track-work Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welding Steel
Railway Track-work Co.
Una Welding & Bonding Co.

Welding Wire
Railway Track-work Co.
Roebling's Sons Co., J. A.

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Railway Track-work Co.

Wheel Guards (See Fenders and Wheel Guards)

Wheel Grinders
Wheel Truing Brk. Shoe Co.

Wheel Presses (See Machine Tools)

Wheels, Car, Steel & Steel Tired
American Steel Foundries
Bemis Car Truck Co.
Standard Steel Works Co.

Wheels, Trolley
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Star Brass Works

Whistles, Air
Westinghouse E. & M. Co.
Westinghouse Tr. Brk. Co.

Window Guards and Fittings
Cincinnati Car Co.

Wire Rope
Roebling's Sons Co., J. A.

Wires and Cables
Okonite Co.
Okonite-Callender Cable Co.
Roebling's Sons Co., J. A.
Westinghouse E. & M. Co.

Simplified Design

IN KEEPING with the present-day trend of simplified practice, the new Brill MASTER UNIT Cars have many dimensions and details of design that are common to all the cars.

The design of general, sectional and end construction has been standardized in order to reduce the variety of replacement parts and simplify construction. All doors open outward. The steps are the "well" type which, of course, eliminates the mechanism necessary to operate folding steps. The following dimensions are common to all cars in the MASTER UNIT series and indicate the general uniformity of construction:

Height, floor to top of roof	7 ft. 6 in.
Height, floor to underside of ceiling	7 ft. 1⅞ in.
Height, floor to window sill	2 ft. 8 in.
Height, side window opening	2 ft. 5¼ in.
Height of raised side window above window sill	1 ft. 1 1/16 in.
Width over sides at belt rail	8 ft. 4 in.
Length of cross seats	2 ft. 11 in.
Width of aisle at cross seats	1 ft. 11 in.
Center to center of side posts	3 ft. 5 in.

Write for all the facts and figures about the Brill MASTER UNIT Cars.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.

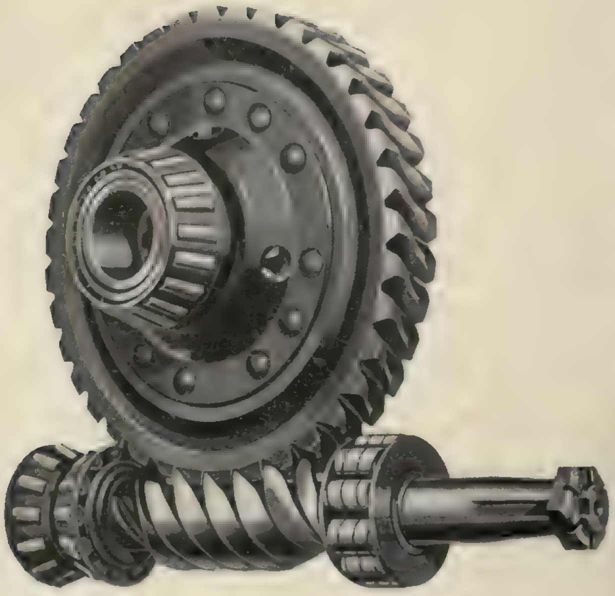
AMERICAN CAR CO. — ST. LOUIS MO.
G. C. KUHLMAN CAR CO. — CLEVELAND, OHIO.
WASON MANF'G CO. SPRINGFIELD, MASS.

Pacific Coast Representative: Rialto Bldg., San Francisco

Brill MASTER UNIT Cars

The Performance
The People
The Profit

Timken Worm Drive for electric railway cars contributes to Profit; by making possible a degree of comfortable Performance which induces People to ride. Timken Worm Drive is permanently dead silent, long lived, simple, highly and uniformly efficient. It means fewer pounds to haul, less power consumed, lower operating and maintenance cost.



TIMKEN WORM DRIVE TRUCKS FOR ELECTRIC RAILWAY CARS

THE TIMKEN-DETROIT AXLE CO., D T A CO DETROIT, MICH.

ELECTRIC RAILWAY
JOURNAL

ill Publishing Company, Inc. MARCH 9, 1929 Twenty Cents Per Copy

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AMERICAN BROWN BOVERI
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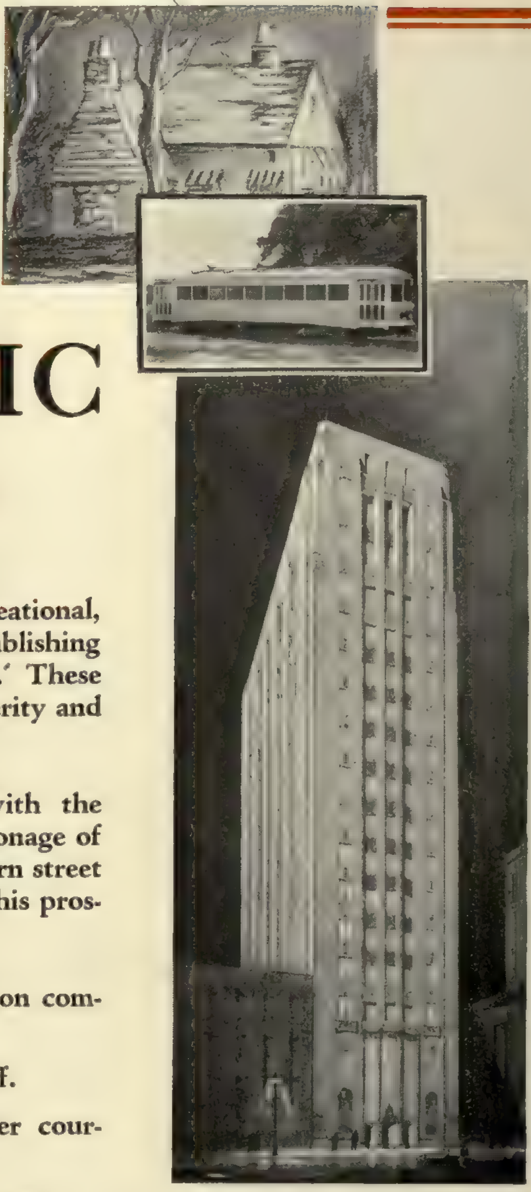

THE PUBLIC *be* Pleased . .

BEAUTIFUL and useful residential, recreational, and business structures are rapidly establishing a new standard of living in American cities. These developments insure the continuance of prosperity and well-being for our increasing population.

Only transportation facilities, in keeping with the requirements of the times, will retain the patronage of the public. Electric railway service with modern street cars, Westinghouse equipped, contributes to this prosperity program in the following ways:

1. Enhances the standing of the transportation company in the community.
2. Improves the morale of the operating staff.
3. Affords improved service through greater courtesy, comfort, speed and safety.
4. Increases receipts because the public is pleased.

Put some of these modern cars on your lines and keep the electric railway industry in step with the times. Now-a-days the public must be pleased!

Westinghouse products for street railways include:—arc welding sets, electric babbitt pots, car heaters, circuit-breakers, snow melters for track switches, fans, instruments and meters, insulating materials, lighting equipment, lightning arresters, line material, motors and control, panelboards, rectifiers, substation equipment.

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION A.E.R.A. 1929

Westinghouse Electric & Manufacturing Co.
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries
T 30383

Westinghouse

Electric Railway Journal

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1929

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680,000 MILES IN 14 YEARS
. . . . AND STILL GOING

The first Westinghouse-Nuttall Helical Gear and Pinion as it appeared after 632,000 miles of service.

ON February 25, 1915, the first Westinghouse-Nuttall BP grade helical gear and pinion was installed on a car for the West Penn Railways.

Today, after more than 680,000 car-miles of service, this same gear and pinion is still in operation.

Exceptional gear mileage! Yes, but BP grade helical gearing can always be depended upon for extraordinary mileage—mileage that means concrete maintenance savings, because:

> The teeth mesh with fifty percent more rolling action than other gears, consequently there is less wear.
>
> Loads are transferred from tooth to tooth gradually, uniformly and smoothly thus preventing "ridging" at the pitch line, which preserves the correct involute tooth form at all times.
>
> The exclusive BP heat-treatment scientifically combines great hardness to resist rapid wear with ample tensile strength and ductility to prevent breakage, spawling and chipping due to the unusual loads, and shocks and jolts of service.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
NUTTALL WORKS PITTSBURGH, PA.

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA 1929

Westinghouse

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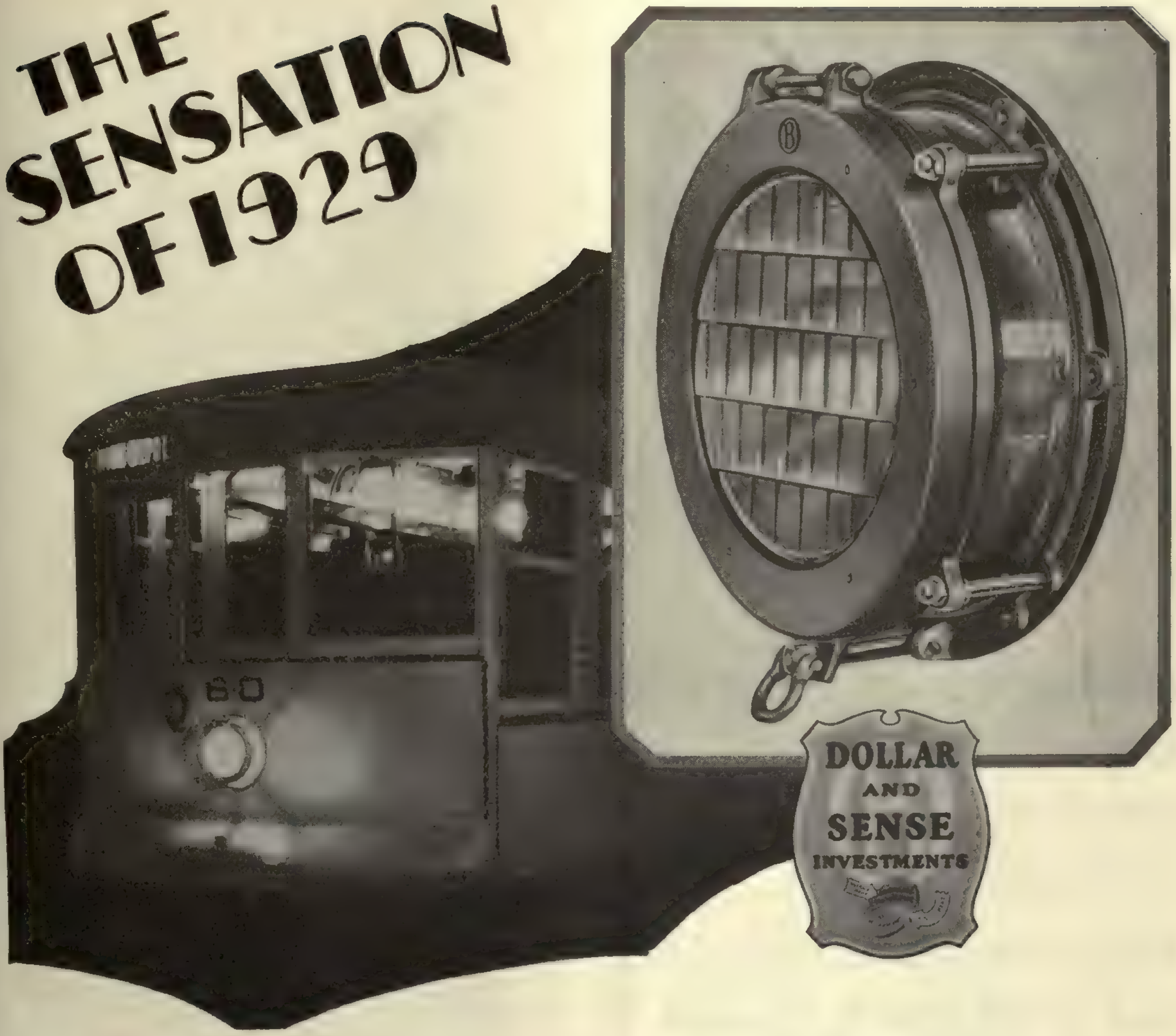
THE SENSATION OF 1929



DOLLAR AND SENSE INVESTMENTS

WITH the development of the modern, lighter-weight, higher-speed cars came a need for greater safety—some method of emphatically identifying an approaching electric car as such to motorists and pedestrians alike.

To do this, many new cars have been equipped with a bank of lamps, concealed in the dash, to illuminate the entire dash.

Now, O-B makes this expensive method unnecessary with a new headlight offered the industry. The O-B Dash Illuminating Headlight provides full dash illumination *from the headlight itself,* as well as ample track pick-up without glare.

The O-B Dash Illuminating Headlight is not designed alone for new cars. It provides up-to-date illumination of the dash for all cars, new or old.

It has been accorded a hearty welcome by equipment superintendents, master mechanics and claim agents wherever it has been shown, and has been specified in orders for many cars at present under construction.

Naturally it follows modern car design principles and is of lightweight aluminum-alloy construction with a ray-deflecting lens and a heat-resisting Pyrex side lens. Fitted with a Crystal Ray glass reflector.

Of course you will want to see the O-B Dash-Illuminating Headlight—the sensation of 1929—on *your* cars. Get in touch with your O-B representative or write or wire

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1014D

Ohio Brass Co.

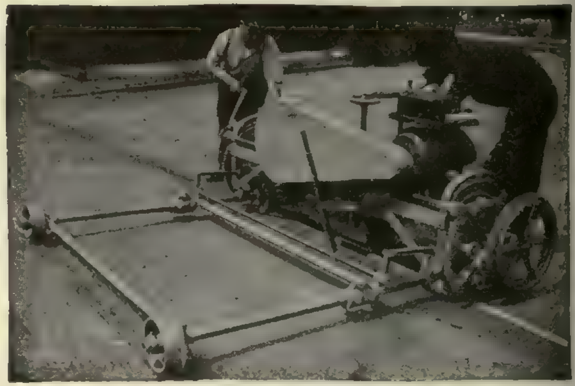
NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ATLANTA BOSTON SAN FRANCISCO CLEVELAND LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

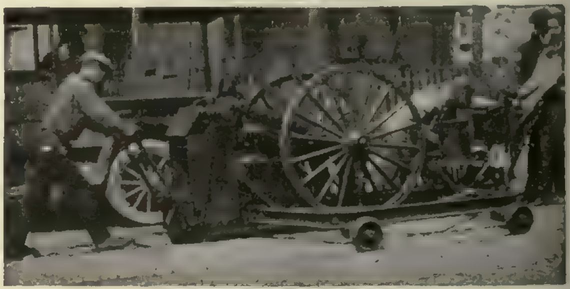
BETTER RAIL, BETTER TRANSPORTATION

Less Noise, Please

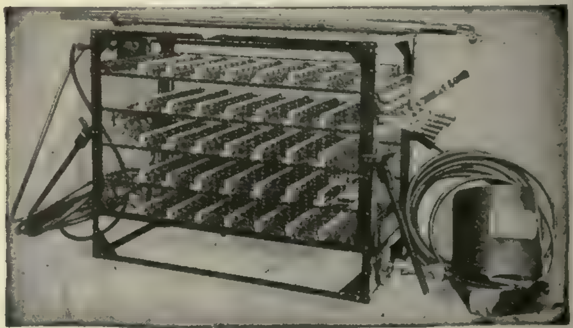
R.T.W. Curve Oiler



Vulcan Rail Grinder



Reciprocating Track Grinder



"Ajax" Electric Arc Welder

Making a noise about good service is good advertising, but noisy service is bad business.

The noise between steel tires and steel track cannot be hushed successfully without track grinding, curve lubrication and joint welding.

Here's approved equipment for these jobs.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
H. F. McDermott, 208 S. LaSalle St., Chicago
P. W. Wood Railway Supply Co., New Orleans, La.
Equipment & Engineering Co., London
Frazar & Co., Japan

3190

BETTER RAIL, BETTER TRANSPORTATION

Open Minded

STEEL ships were laughed at. Steel wouldn't float! Old timers laughed and kept on building wooden ships. Open minded masters investigated—and built steel ships.

Wood ties were good for paved track construction — they were the only thing we had. Wood beams were good for buildings, too. But steel has proved to be eminently better for both—steel reinforces concrete—steel can be fabricated to standard shapes and sizes—steel lends itself perfectly to modern production machinery. Steel has endurance that lasts!

Open minded operators, who tried Steel Twin Ties fifteen years ago, buy Steel Twin Ties today.

Open mindedness has brought industry to its high state of efficiency. Steel Twin Ties and mass production methods have brought efficiency to paved track construction, have made that construction more endurable.

The International Steel Tie Co.
Cleveland, Ohio

STEEL TWIN TIE TRACK

The Base of Modernization

GETTING DOWN TO BRASS TACKS

REDUCED to its essentials the "One-Wear" idea is to make a wheel with sufficient wear resistance to give the desired life without contour conditioning.

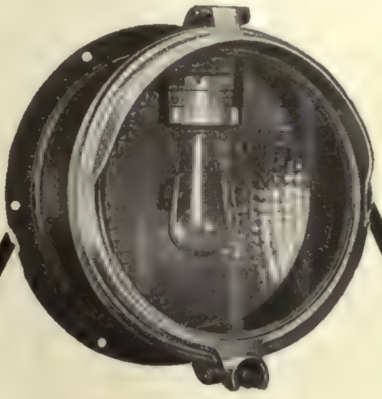
Only an unusual steel can develop the desired resistance to wear. That is why a special heat-treated wheel steel is used in making the Davis "One-Wear" Steel Wheel.

ASF

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

A *new*
Golden Glow Headlight
especially designed for city and suburban service



The new Railway Type Golden Glow headlights are of particularly attractive appearance to conform to the lines of modern electric cars, being intended for general city and suburban service where a high beam candle power headlight is not desired.

The 9-inch Golden Glow prismatic glass mirrored reflectors and the Keystone refracting front lens give a pleasing, soft but penetrating yellow light of sufficient intensity for ordinary city and suburban speeds.

Two types:—one for surface mounting and one for semi-flush mounting. They both have polished aluminum front doors fitted with a small visor giving a very attractive appearance.

Let us send details of these modern headlights for modern cars.

ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, New York City.

Branches—Bessemer Bldg., Pittsburgh; 88 Broad Street, Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

PRE-PROVED

IT does not take 30 years to treat a pole but it does take 30 years to prove that a company's methods of manufacture and treatment produce poles that are durable and can withstand the elements for such a long period of time. It is a long and tedious test but the only true measure of service life and pole value.

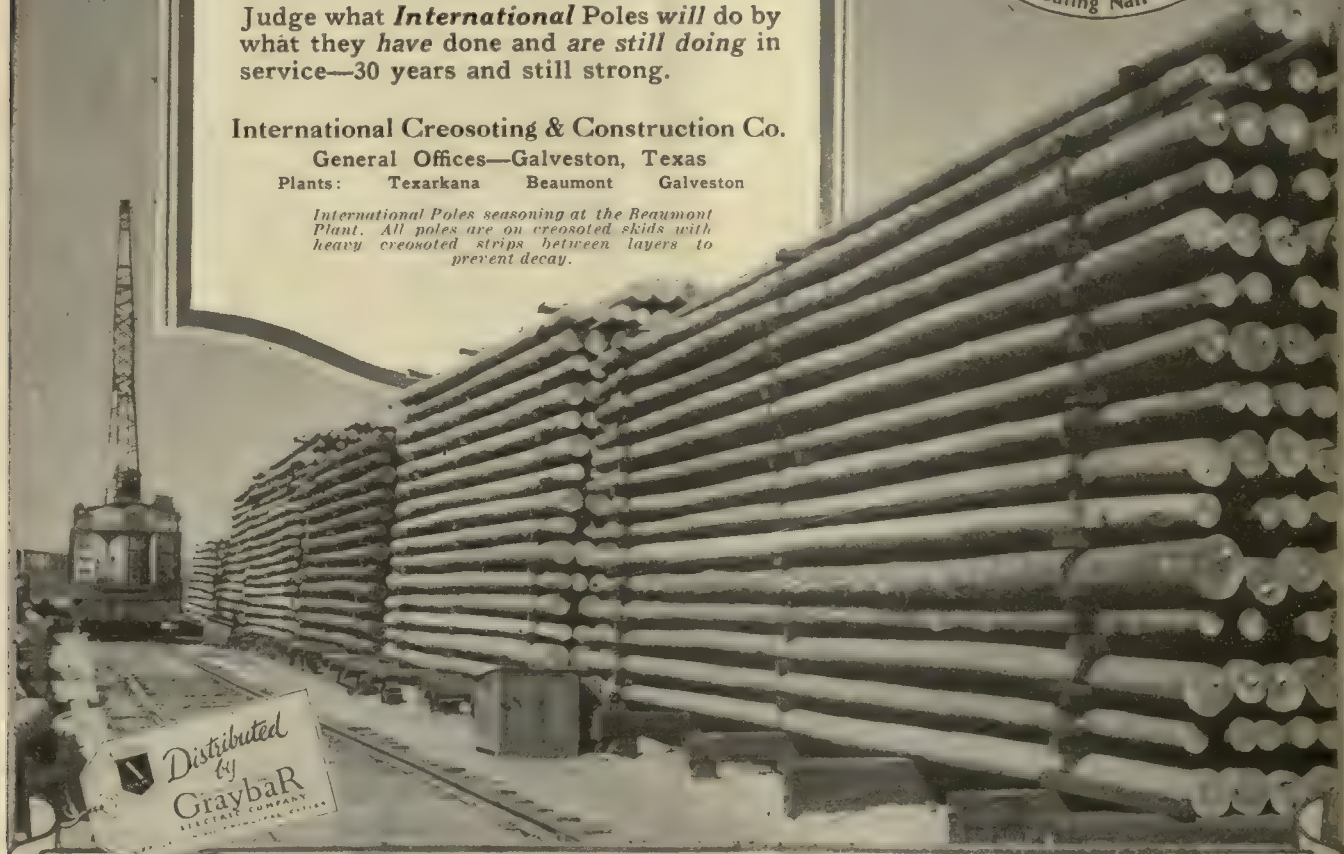
It takes many years to acquire the necessary practical knowledge and treating experience; it takes even longer to build an efficient organization which can produce poles of the highest quality at the lowest possible cost. ***International*** has both—and both have passed the test of time.

Judge what ***International*** Poles ***will*** do by what they ***have*** done and ***are still doing*** in service—30 years and still strong.

International Creosoting & Construction Co.
General Offices—Galveston, Texas
Plants: Texarkana Beaumont Galveston

International Poles seasoning at the Beaumont Plant. All poles are on creosoted skids with heavy creosoted strips between layers to prevent decay.

2 IC 9
The International Dating Nail



Distributed by GraybaR Electric Company

International
Creosoted Yellow Pine Poles

28

BUS TRANSPORTATION

February, 1929

More and More Powerful Engines

Where Will the Trend Stop?

VE KEEP ON in
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CONSTANTLY increasing motor coach weights—particularly of those designed for what is generally termed heavy-duty service—is causing the manufacturer to consider seriously the use of larger and more powerful engines. That several manufacturers are at present experimenting with engines designed to give a power output well in excess of 100 hp. is more or less common knowledge. Just how well these units will fit into the motor coach ture is open to conjecture.

appreciate better what has
way of devel

we believe

Frank R. Fageol solved the problem ahead of time

Two years ago he foresaw the "big motor" situation which today finally has struck home forcibly to the entire coach industry.

Two six cylinder motors of practical size was his answer and his contribution to the coach field.

He found the way—for more power—while he increased the capacity of the coach 40% and decreased the weight per seat by 30%.

Was his answer sound?

1928 records of buses bought by electric railways show:

TwinCoach 1st

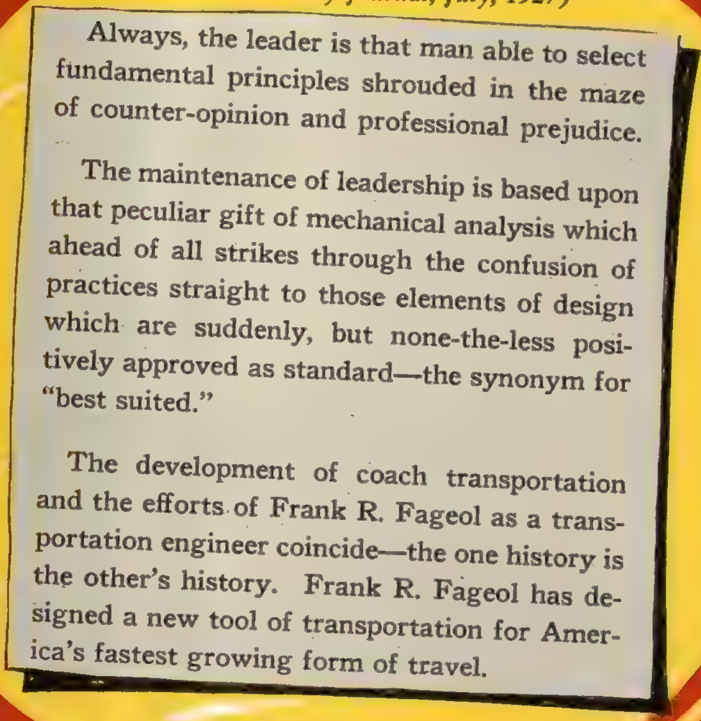
in large capacity buses bough

TwinCoach 2nd

in total buses bought

The Test of Time

(Reprint from First Twin Coach Advertisement Electric Railway Journal, July, 1927)



Always, the leader is that man able to select fundamental principles shrouded in the maze of counter-opinion and professional prejudice.

The maintenance of leadership is based upon that peculiar gift of mechanical analysis which ahead of all strikes through the confusion of practices straight to those elements of design which are suddenly, but none-the-less positively approved as standard—the synonym for "best suited."

The development of coach transportation and the efforts of Frank R. Fageol as a transportation engineer coincide—the one history is the other's history. Frank R. Fageol has designed a new tool of transportation for America's fastest growing form of travel.

Looking Ahead

In the Automotive Street Car Field

Which Shall It Be—30′ Overall Length or 36′ ?

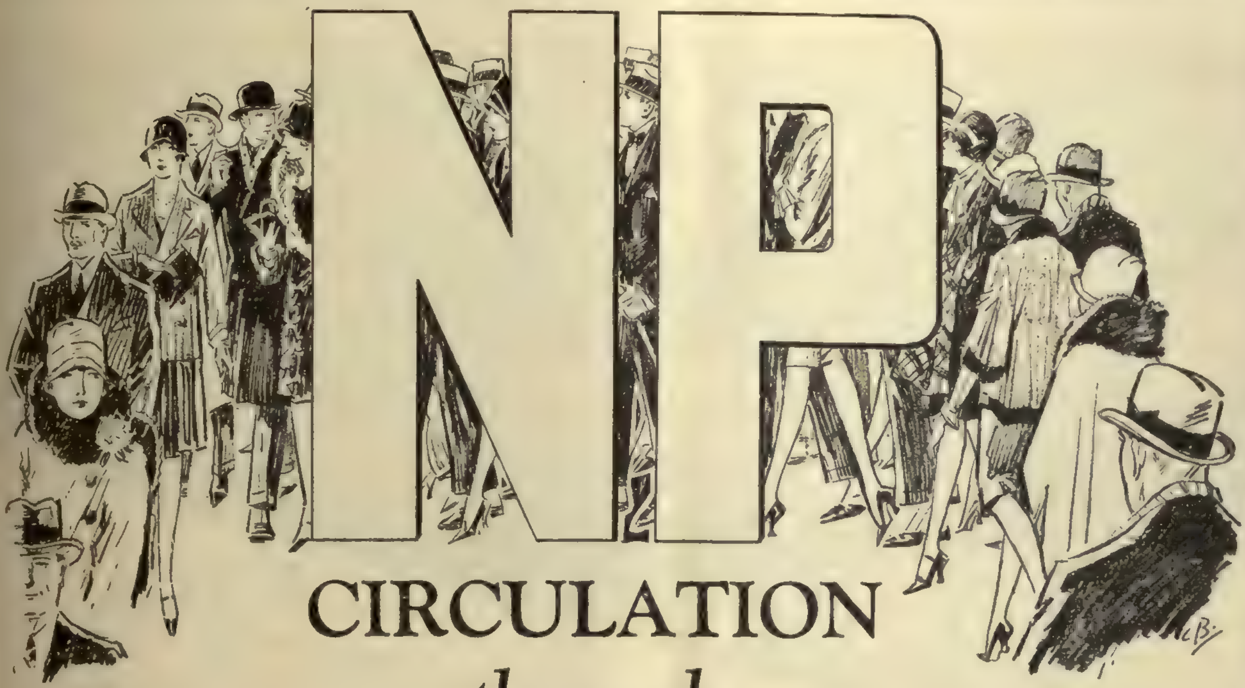
We now are engaged busily in taking the Twin Coach Automotive Type Street Cars through that period and process of converting the construction and design from the experimental model stage to that of practical manufacturing.

The fundamental underlying principles and design of these cars are sound, and we anticipate getting into quantity production on them during the early spring. During the interim we shall greatly appreciate hearing from those in the industry who contemplate making purchases of medium size light weight cars regarding capacity and length.

We hope for suggestions from the industry regarding this point because we want to decide and concentrate on the manufacture at this time of only one size of standardized car in the medium sized field. We hope, however, to have something to say to you at a little later date regarding a larger type car, it being our plan and intent finally to manufacture two sizes of cars.

TWIN COACH CORPORATION
Kent, Ohio

Twin Coach
BY F.R. FAGEOL KENT, OHIO



CIRCULATION
through

TREADLE-IZATION

More and more operators are equipping their cars with Treadles, because it increases efficiency and provides greater safety and economy.

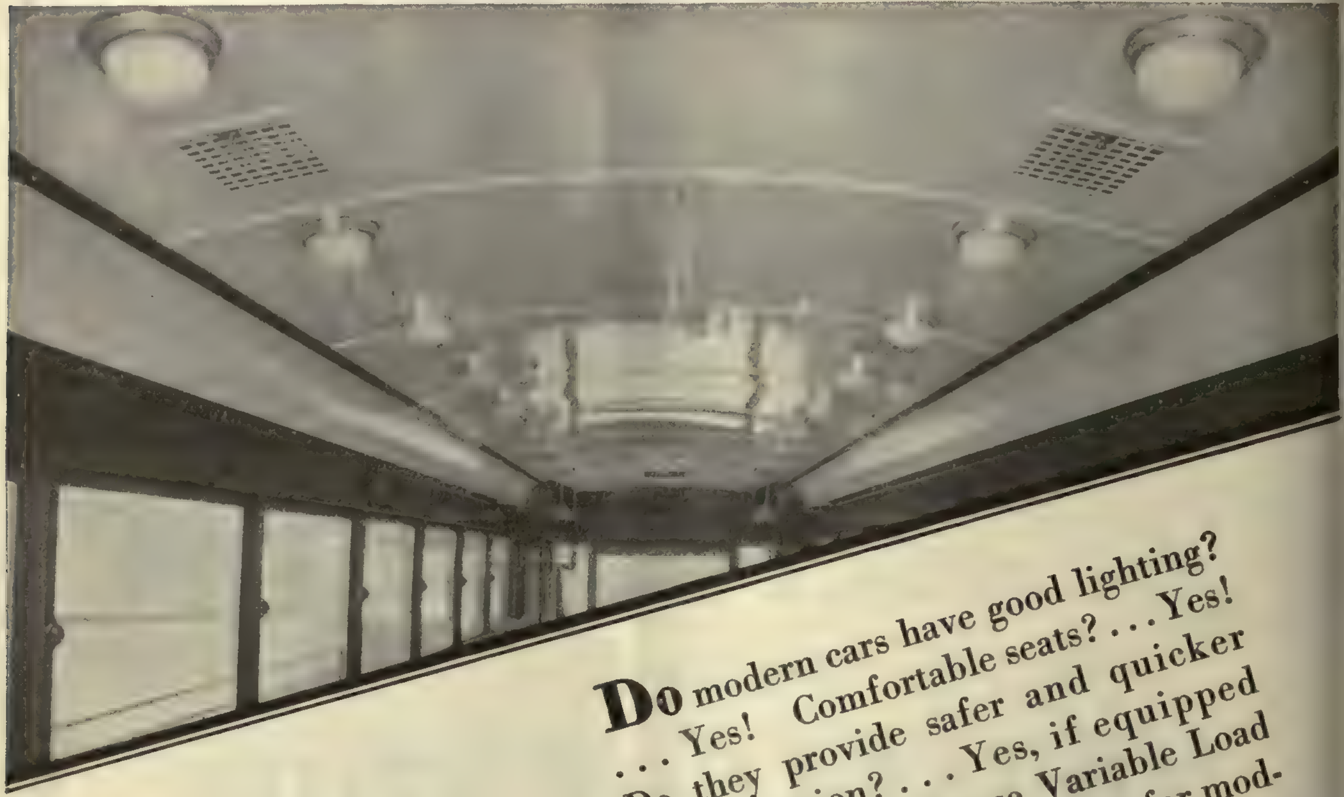
NP

NATIONAL PNEUMATIC COMPANY
Executive Office: Graybar Building, New York
General Works: Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building



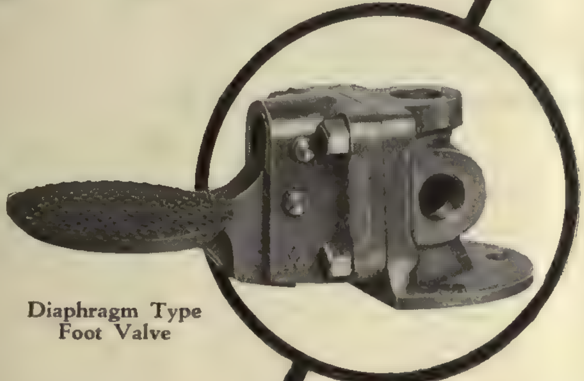
Do modern cars have good lighting? . . . Yes! Comfortable seats? . . . Yes! Do they provide safer and quicker transportation? . . . Yes, if equipped with the Westinghouse Variable Load Brake . . . the modern brake for modern cars.

MODERN CARS
NEED
MODERN BRAKES

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works . . . WILMERDING, PA.

Improving a good Equipment

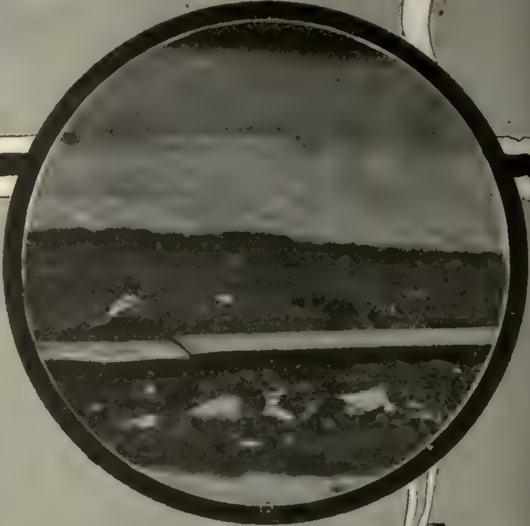
Diaphragm Type
Cut-Off Valve



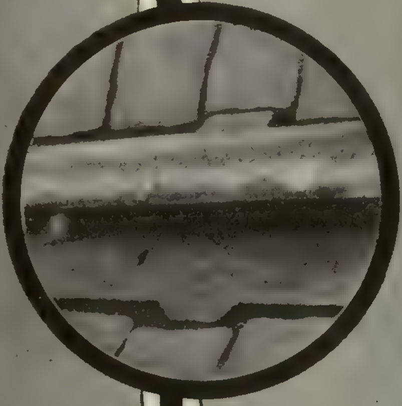
Diaphragm Type
Foot Valve

Two improved devices have been developed for the well known Safety Car Control Equipment—the Diaphragm Foot Valve and Diaphragm Cut-Off Valve — which replace the combined valve formerly used. Installation is simplified somewhat as only one Cut-Off Valve is required, and more satisfactory performance is assured because the diaphragm construction prevents leakage. These improved devices are now furnished with standard equipments.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH



Nothing costs so much as a rail joint *that costs a little less —*



Price is a deception which often blinds intelligent men to real value.

Above is shown a rail joint,—low, cupped and battered. There are two alternatives before you—either to repair it by one of several more or less common expedients—or to **eliminate** that joint as a source of trouble for good and all.

It's a little cheaper (the first time) merely to patch it up. It costs a little less—to start with. But experience shows it usually has to be done again in a few months. And then again!

At the left you see the job which may perhaps cost a trifle more at the start. A job which never needs to be done again during the life-time of the rail. A Thermit job!

Ask yourself which policy is truly the "cheapest."

THERMIT

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

FLAT WHEELS DON'T IMPROVE RIDER RELATIONS—

How about your wheels?

Passengers don't tolerate the miserable riding qualities of "flat," badly worn or inaccurate wheels.

Standard Wheels and Axles check O. K. from standpoints of passenger comfort and long, economical wear.

Rolled Steel Wheels *Armature Shafts* *Axles and Springs*

"FOR EVERY TYPE OF CAR

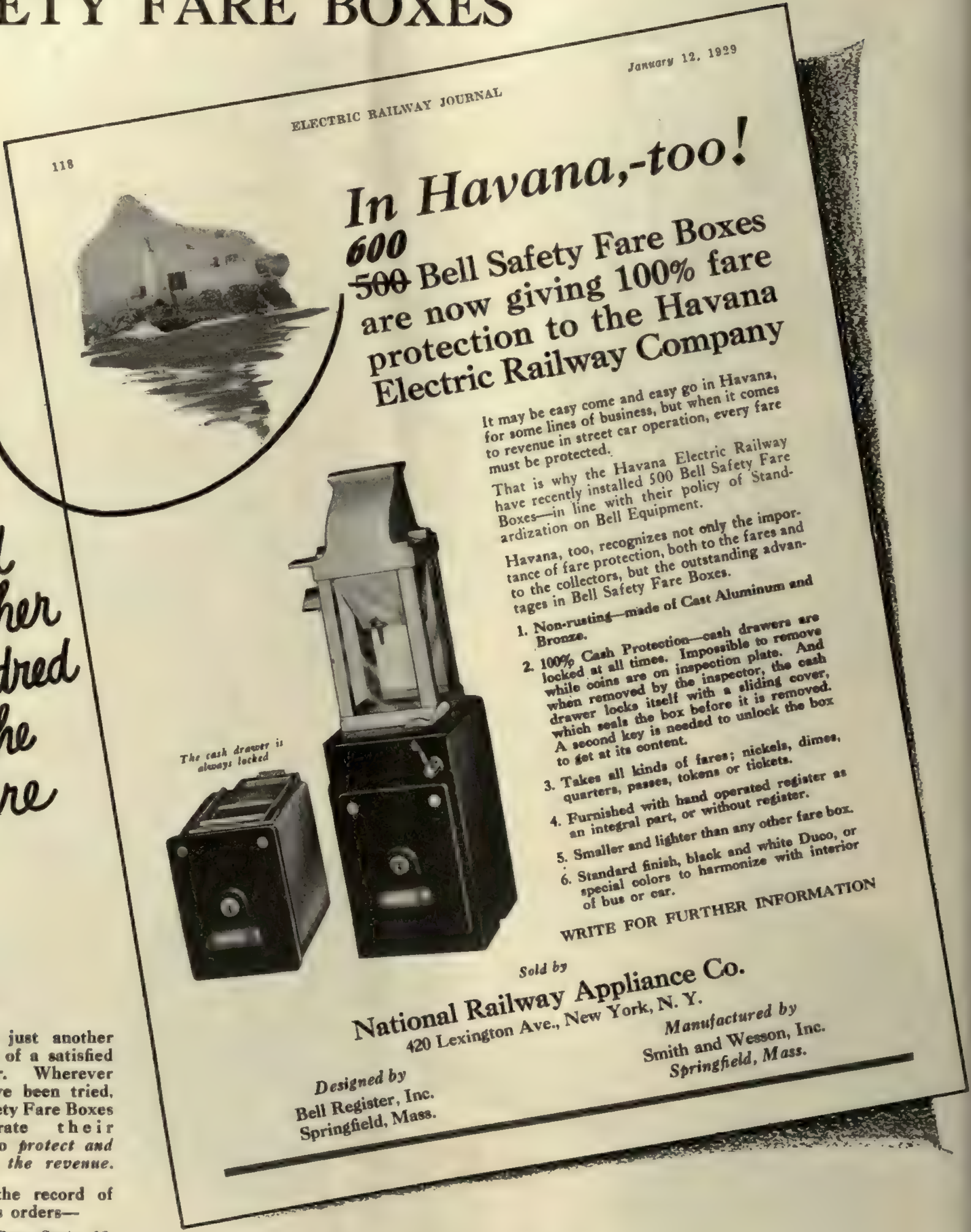
S

IN EVERY TYPE OF SERVICE"

STANDARD STEEL WORKS COMPANY
PHILADELPHIA, PA.

BRANCH OFFICES:
CHICAGO NEW YORK PORTLAND SAN FRANCISCO
ST. LOUIS HOUSTON RICHMOND PITTSBURGH
WORKS: BURNHAM, PA.

Another 100 BELL SAFETY FARE BOXES



ELECTRIC RAILWAY JOURNAL January 12, 1929

118

In Havana,-too!

600 ~~500~~ **Bell Safety Fare Boxes are now giving 100% fare protection to the Havana Electric Railway Company**

It may be easy come and easy go in Havana, for some lines of business, but when it comes to revenue in street car operation, every fare must be protected.

That is why the Havana Electric Railway have recently installed 500 Bell Safety Fare Boxes—in line with their policy of Standardization on Bell Equipment.

Havana, too, recognizes not only the importance of fare protection, both to the fares and to the collectors, but the outstanding advantages in Bell Safety Fare Boxes.

1. Non-rusting—made of Cast Aluminum and Bronze.
2. 100% Cash Protection—cash drawers are locked at all times. Impossible to remove while coins are on inspection plate. And when removed by the inspector, the cash drawer locks itself with a sliding cover, which seals the box before it is removed. A second key is needed to unlock the box to get at its content.
3. Takes all kinds of fares; nickels, dimes, quarters, passes, tokens or tickets.
4. Furnished with hand operated register as an integral part, or without register.
5. Smaller and lighter than any other fare box.
6. Standard finish, black and white Duco, or special colors to harmonize with interior of bus or car.

The cash drawer is always locked

WRITE FOR FURTHER INFORMATION

Sold by
National Railway Appliance Co.
420 Lexington Ave., New York, N. Y.

Designed by
Bell Register, Inc.
Springfield, Mass.

Manufactured by
Smith and Wesson, Inc.
Springfield, Mass.

add another hundred to the figure

This is just another example of a satisfied customer. Wherever they have been tried, Bell Safety Fare Boxes demonstrate their ability to *protect and increase the revenue.*

Here's the record of Havana's orders—

Sample Box—Sept. 18, 1928

Ordered	29	Oct. 4
	30	Dec. 6
	100	Dec. 17
	140	Dec. 27
	200	Jan. 3, 1929
	100	Jan. 31

Sold by

National Railway Appliance Co.
420 Lexington Ave., New York, N. Y.

Designed by
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Springfield, Mass.

~penetrates dirty surfaces

Welding on dirty surfaces is not recommended. Best welds are made on clean surfaces free from grease, mud, rust, and other forms of dirt and corrosion. However, if it is necessary to weld under such adverse conditions, G-E Type "F" electrode gives best results. This is why Type "F" commends itself to traction companies, whose welding frequently consists of repairing flanges, journal boxes, gear housings, and other exposed parts.

As a rule, such welding is not subject to subsequent machining. A smooth bead is, therefore, desirable, and Type "F" electrode, with its arc stability and free-flowing characteristics, makes this smooth bead possible.

For prompt service or additional information as to various types of G-E electrodes, get in touch with the G-E Welding Electrode Distributor near you or write to Section E-503, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

In absolute reliability of operation and over-all efficiency, G-E arc-welding sets are unequalled. They are available in all sizes, all types—for either hand or automatic operation—for one or more operators.

550-505

GENERAL ELECTRIC

MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT

AS A BUS OPERATOR

— YOU SHOULD KNOW THAT FOR THE SAME SERVICE *GAS-ELECTRIC AND MECHANICAL BUSES HAVE EQUAL FUEL CONSUMPTIONS*

A GAS-ELECTRIC usually consumes more gasoline than a corresponding mechanical bus, but it is because the gas-electric operates on a faster schedule. Where the service and the schedule speed are identical, the gasoline consumption is equal with both types of drive.

Hence, fuel costs do not offset the economies effected by the gas-electric in maintenance, platform expense, and the accident account.

Let the General Electric transportation engineers analyze your service and make recommendations for the best type of equipment.

390-48

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

McGraw-Hill Publishing Company, Inc.
James H. McGraw, *Chairman of the Board*
Malcolm Muir, *President*
H. C. Parmelee, *Editorial Director*

CHARLES GORDON, *Editor*

Louis F. Stoll, *Publishing Director*

Volume 73 New York, Saturday, March 9, 1929 *Number* 10

Electric Railway Journal to Change Publishing Plan

EFFECTIVE with the last issue in March, Electric Railway Journal will change its plan of publication. Under the new program feature articles and display advertising will be concentrated into a bigger and stronger publication to be issued monthly instead of weekly as heretofore. The first appearance of the magazine in its new form will be the April number, which will also be the Annual Maintenance Number. Subsequent numbers will appear regularly on or about the first of each succeeding month.

The monthly publication will retain all of the best features of the present weekly, including news of the industry for the month, with the addition of many articles of broad research and survey types searching deeply into the fundamentals of the local transportation business.

RECOGNIZING the importance attached by the industry to the Journal's weekly news service, this feature will be continued as Electric Railway Journal News, to be issued each Saturday except in those weeks in which the monthly appears. In this way, up-to-the-minute news of transportation developments and events will be published in handy form for busy executives. Every effort will be made to condense all of the essential news to save the reader's time, consistent with a presentation of important facts. Particular attention will be directed toward those classes of news in which executives and department heads are most interested.

The Journal's special services at the time of the annual convention, which have long been recognized as outstanding features contributing toward the success of the annual meeting, will be retained and improved. These include the Annual Convention Number, the Convention Report Number and the Convention Dailies issued during convention week. In a full year there will be 13 issues of the monthly, the extra issue being either the Annual Convention Number or the Report Number, depending on the time of the month at which the annual convention is held. This year, the Convention Number will appear about Sept. 15, following the regular September issue earlier in the month. The Report Number this year will be the regular October issue.

THUS, in taking this important step, Electric Railway Journal is like its industry, meeting changed conditions with new and improved methods. Just as it has been the railway executive's duty to interpret and if possible to anticipate the public's demand for changed standards of transportation service, so has the Journal endeavored to meet the changing requirements of its readers and advertisers.

At this stage of the industry's development, in which great underlying questions of economics and policy overshadow in importance routine matters of operating practice, there is obviously less need for frequency of publication of feature material than of searching analysis, careful selection and thorough presentation. Nor does this hold true only of broad, fundamental questions of policy and management. In operation and maintenance as well, routine methods of various properties are quite widely and thoroughly disseminated. The average Journal reader is less interested in the frequency with which operating and maintenance articles appear than in the thoroughness with which new practices and methods are analyzed and presented.

All of this makes the JOURNAL's new publishing plan both logical and desirable. Throughout the period of rapid technical changes and development of practices and methods, when timely publication was the important thing to its readers, the JOURNAL maintained its weekly basis. Now that the separation of current news from feature articles seems best suited to the needs of its readers, the JOURNAL, regardless of its long years of previous practice, does not hesitate to break with habit and precedent to meet changed conditions.

IN TAKING this step ELECTRIC RAILWAY JOURNAL pledges anew its faith in the basic soundness and broad possibilities of the local transportation industry. It will continue to point out the road toward improvement as it sees the light from careful study of many properties and consultation with the best minds in the industry. It will continue to attack fearlessly the competence of those who would write off the books this essential $6,000,000,000 industry which has made possible the development of modern cities as we know them today and which serves as the circulatory system vital to their existence.

It will continue to oppose visionary plans for the construction of multi-deck streets at public expense, while advocating intelligent allocation of present street space to maximum community usefulness. It will continue, likewise, to point out weaknesses within the industry and to criticize—constructively always—measures dictated by expediency rather than sound economics and forward-looking public policy. In short, the JOURNAL continues as its slogan those words applied to it not long ago by a prominent electric railway executive, himself one time a journalist—"A publication which lives for, not off, its industry."

The Country's Purpose Under Mr. Hoover

IT WAS not to be expected that President Hoover, in his inaugural address, would do more than suggest some of the subjects which will receive his attention first. As he said, the questions before the country are problems of progress to higher standards; they are not the problems of degeneration. The new administration is pledged among other things to the continuance of economy in public expenditure, the regulation of business to prevent domination in the community and the denial of ownership or operation of business by the government in competition with its citizens. He had quite a little to say about law enforcement. As for business, it has by co-operation made great progress in the advancement of service, in stability, in regularity of employment and in the correction of its own abuses. Such progress can continue only as long as business manifests its respect for law. Regulation of private enterprise and not government ownership or operation is the course rightly to be pursued in the relation of government to business. One passage in particular in his address looks to a great enlargement of manufacturing and commerce, probably in the hands of still bigger corporations, with which the government will not interfere, except to regulate the service and prices of public utilities, which are virtual monopolies. A special session of Congress is in prospect to deal with the agricultural relief and limited changes in the tariff.

As Edward N. Hurley, an astute observer but a Democrat, said, it is unfair continually to expect Mr. Hoover to pull rabbits out of hats. No matter what his earnest friends may say for him, Mr. Hoover is too well schooled to expect to attain the impossible. He knows that it is not possible so to arrange affairs that an incompetent man can continue in business and earn money. He knows that small businesses put together over night and sold to the public do not make big business enterprises. On the other hand, idle prosecution of business is less likely under him than it was even under Mr. Coolidge. In the Department of Commerce Mr. Hoover did a great deal to bring men together to work out their own problems. As President there is no reason why he should be any the less successful in work of this kind. Under him it is to be expected that public work will be carried out along engineering rather than political lines. As for the tariff there are few who know what they want and still fewer who would recognize what they wanted if they got it. This Mr. Hoover also knows, just as he knows that problems of economics are not settled by oratory. Mr. Hoover knows what his task means. He knows the responsibility it involves. He asks of his fellow citizens their tolerance, their aid and their co-operation. All of these he is entitled to receive.

Relieving Delay Caused by Traffic Signals

SELDOM has so clear a case against improperly arranged traffic signals been made out as is contained in the report prepared by Kelker, DeLeuw & Company on the operation of the Fourteenth Street line of the New York Railways. Though this report, abstracted elsewhere, treats particularly of street car movements the same principles are of equal force with respect to vehicles in general. The traffic signals in New York City were installed primarily to facilitate the movement of north-south traffic, which in general is considerably greater than the east-west traffic. However, all the signals on a single avenue are synchronized, the relative length of time allotted to the two directions presumably being determined by the proportion of movements at the maximum traffic point. Furthermore, in an effort to have a city-wide system, the movements on parallel north-south avenues have also been tied together, regardless of the fact that traffic conditions at many intersections differ from those at the maximum traffic point.

On Fourteenth Street the result has been to delay all traffic and cause traffic blockades throughout the entire day. For instance, the signal system limits the track capacity to 84 cars per hour, whereas to meet the demands in the maximum hour 103 cars are scheduled. Besides this, the cars must move across the intersections in bunches of six or seven, precluding good service.

One of the primary causes of these delays is the extreme length of the cycle, 220 seconds, of which 160 seconds is devoted to north-south movement and the remaining 80 seconds to east-west movement. It is pointed out in the report that merely by reducing the length of the cycle to 150 seconds, keeping the relative proportions of time the same, the delays will be so reduced that the scheduled cars can be operated in the maximum hour. It is also shown that this reduction in the length of cycle will not reduce the capacity of the street for vehicles, and in fact will increase materially the schedule speed for all traffic.

Experience in other cities would indicate that for an area so great as that covered in New York, bounded by 45th Street, Second Avenue, Canal Street and Seventh Avenue, any universal signal cycle must result in great delay. Much shorter cycles than 150 seconds would be found advantageous at some locations. It is evident that an intensive study will show that each intersection of each group should be considered independently and a traffic control devised that will give to each street the maximum capacity, which obviously is impossible with a city-wide co-ordinated system.

Rigid Legal Code Adopted in New York

REAL good has come of the inquiry into ambulance chasing in New York City. The practice had grown to a point where it had become insufferable. Some lawyers have been recommended for discipline, others have actually been disciplined, and still others, sensing the handwriting on the wall, have chosen to eliminate themselves from the profession. Best of all, however, the Appellate Division of the Supreme Court, First Department, has adopted rules applying to practitioners in New York and Bronx Counties, designed to end ambulance chasing. In short, the court has drafted rules intended to clean up the bar. Ambulance chasing is forbidden, as is also the solicitation of retainers. Settlement terms are fixed. The code adopted is rigid and embraces reforms urged by Justice Wasservogel with the single exception of the recommendation that perjury and subornation of perjury be punished as misdemeanor. Only those rules have been omitted from the new code which are regarded as requiring legislative action. To effect these reforms, bills were introduced in the Legislature. Although they were lost in committee their proponents are determined not to give up the fight for them.

As has been pointed out before in ELECTRIC RAILWAY JOURNAL, one of the astounding things brought out by the inquiry was the lack on the part of those arraigned for ambulance chasing of any realization of a real code of professional ethics. Many of the practices followed in the accident cases were most nefarious. The important point, however, is that the bar has started to clean up. It is reasonable to expect that as a result of all the recent agitation the recommendations will be adopted that have been made by William D. Guthrie, president of the New York Bar Association, and reiterated recently by Prof. I. Morris Wormser and others. Among other things suggested is a thorough inquiry into the character, background and environment of applicants for admission to the law schools. There is, of course, no way that would prove wholly effectual in keeping out of the profession men who are undesirable, but the raising of the requirements for admission to the law schools and for graduation will certainly tend to better the general standard. By and large, the overcrowding of the profession so apparent in New York is merely a reflection of a condition only slightly less true in other large centers of population. The lure of the metropolis appears to be equally as strong for the lawyer as it is for men in other lines. Almost in direct proportion as competition for cases became keener the standards of practice appear to have deteriorated.

Meeting the New Conditions in the New Way

SAMUEL KAHN, president of the Market Street Railway, San Francisco, Cal., has every right to speak about the key to the solution of the problems of the street railway. Certainly, his company, operating at a 5-cent fare under conditions in some instances competitive, has done many progressive things toward making its service attractive. It would almost seem that the company has run the complete gamut of devices so far designed to achieve this end. Some of the things the company has done Mr. Kahn has reviewed in *Byllesby Management* for January, 1929, but it is the spirit manifested in his remarks that is most reassuring.

Industrial conditions were not so good in San Francisco last year. Despite this the decline in business on the Market Street lines was proportionately less than that in any other major city, excepting, of course, the comparatively few cities such as Chicago and Cincinnati, where increases were scored. This record was made because the company left no stone unturned in its efforts to increase patronage through increased good will and closer conformity to the wishes of the riding public.

It went after business wherever crowds assembled. In some cases it was successful in bringing to San Francisco events which would increase riding on its lines. It smoothed out pavements where intersecting streets cross its tracks to please those who ride in automobiles, the very people it desires to have ride in its cars. It laid new crossings quieter than the old ones. It continued to install soft leather upholstered seats for the greater comfort of its patrons. It speeded up its cars. It eliminated slat flooring, a menace to the women with the high-heel shoes. It kept its buildings attractive in appearance by painting and repainting them. It reminded the people of San Francisco of the company's mission by losing no opportunity prominently to display the company's shield. These are merely a few of the things it did. They are very important, particularly in that they reflect the firm conviction of the management that continued growth in automobile competition is not the whole story of declining street railway revenues.

To some street railway men, long engaged in a monopoly business, it came as a shock to have to relearn that the history of business all over the world is replete with instances of industry being faced with changing commercial conditions. But it did not come as a shock to the San Francisco management. It had no new lesson to learn or no old lesson to relearn. Mr. Kahn and the men under him have proved by their work that they know that those industries which have maintained leadership, despite changing social conditions, are industries that have found ways of altering their products and commercial methods to conform to the new age. Few street railway systems have had to contend with conditions more adverse than those which have confronted the Market Street Railway, and certainly few systems have risen to the occasion with a greater degree of success.

Long Traffic Cycles Cause Delays

Signals on Fourteenth Street, New York City, occasion serious interference with street car and vehicle movements and result in bunching of cars and poor service, according to report made by Kelker, DeLeuw & Company

DELETERIOUS effects of synchronized traffic signals with long cycles are shown in a recently released report to the New York Railways Corporation by Kelker, DeLeuw & Company, consulting engineers of Chicago, relative to the operation of the Fourteenth Street Line in New York City. The findings, which are based on a large number of observations, show that the running time of street cars in the zone between First Avenue and Eighth Avenue is increased by the existing system of traffic control from 32 per cent to 80 per cent, while individual trips required more than 100 per cent additional running time. By reason of the delays caused by traffic signals, a number of cars are detained or held in the zone between these streets, thereby being prevented from providing the service scheduled elsewhere on the line. The present operation and timing of traffic signals limits the track capacity to 84 cars per hour, whereas 103 cars are scheduled in the maximum hour. It is shown that by retaining the existing system of traffic control and simply reducing the signal cycle from 220 seconds to 150 seconds, the 103-car schedule can be operated through the signalled zone in an hour. Such a change in the signal cycle will not decrease the capacity of the north-south streets, nor will it reduce the distance which can now be travelled in an hour, nor diminish the over-all speed. It is also shown in the report that the existing method of traffic control could be replaced by other methods that would cause little or no delay to the crosstown street car traffic. Following is a resumé of the salient features of the report.

The major portion of the line is on Fourteenth Street, the route length being 3.33 miles, with a maximum running time of 53 minutes per round trip, and a minimum headway of 34 seconds. The movement of the cars between Second Avenue and Seventh Avenue is controlled by traffic signals at locations shown in the chart. All except the one on Second Avenue are operated on a signal cycle of north-south, 135 seconds and east-west, 75 seconds with dark periods of 5 seconds between each change. The total time is 220 seconds per cycle. Field observations showed that the average time allowed for north-south movements was 140 seconds, and for east-west movements, 80 seconds. The signal at Second Avenue has a 180-second cycle, 120 seconds north-south and 60 seconds east-west. The signals are all operated by hand from control towers and the timing is transferred by visual or audible signals to co-ordinate the various systems and their subdivisions.

All signals start at 8 a.m. and continue with the 220-second cycle until 7 p.m., when the time is changed to 120 seconds north-south and 55 seconds east-west.

CHECK OF TRAFFIC SHOWS MANY DELAYS

Observations made at the various intersections of all vehicles entering at the principal corners showed that the maximum north-south traffic on any of the controlled avenues in any half-hour period was 729 vehicles at Seventh Avenue and 45th Street, with 260 vehicles east and west at the same point, or 35.7 per cent as many.

RANGE OF RUNNING TIME AND SIGNAL DELAYS ON FOURTEENTH STREET SURFACE CARS, NEW YORK CITY

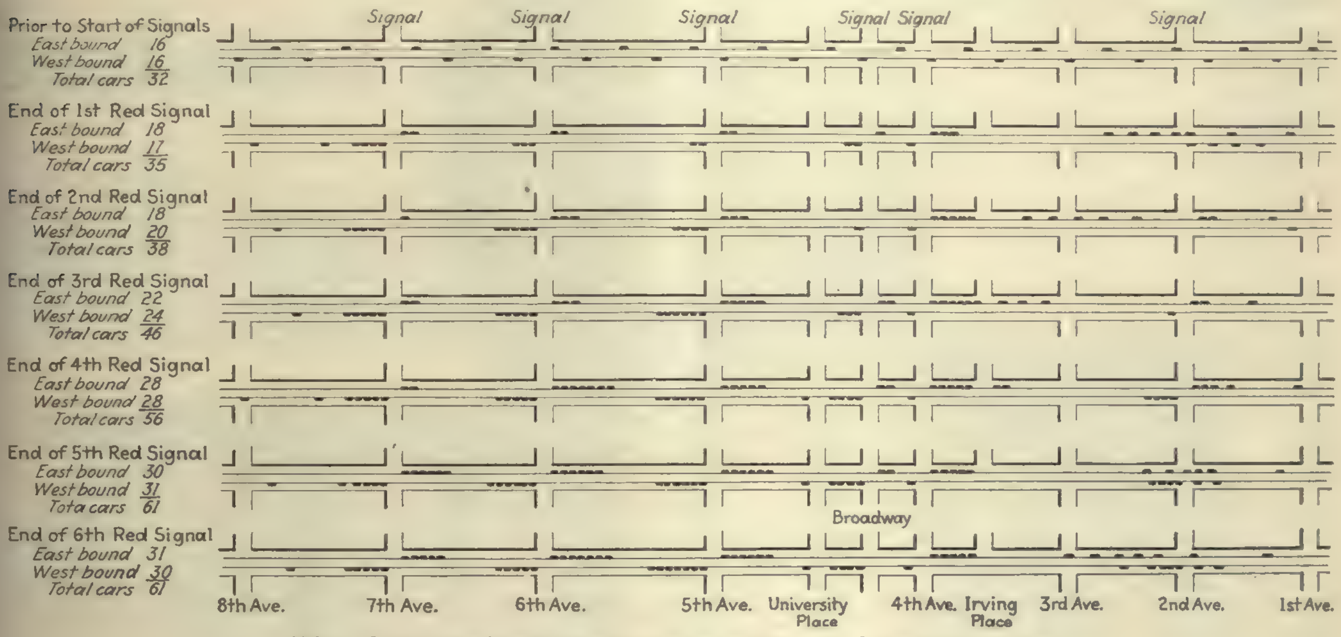
Period	—Actual Running Time— Minutes Eastbound	Westbound	—Traffic Signal Delay— Minutes Eastbound	Westbound
6-8 a.m.	6½– 8½	7 – 9½	None	None
*8–9:30 a.m.	9 –16	12 –17½	2 – 6½	2½– 8
9:30 a.m.-5 p.m.	12 –18	12 –19	2 – 9½	3½– 9½
*5–7 p.m.	14 –18	15 –19	4 – 7	6 – 9½
†7–10 p.m.	8 –13	9½–15	1 – 5	2½– 8

*Rush hour periods. †North-south and east-west traffic signal intervals reduced to 120 and 55 seconds, respectively, at 7 p.m.

On Fourteenth Street, the maximum north-south traffic was 635 vehicles at Fourth Avenue, with maximum east-west traffic of 159 vehicles. The maximum east-west traffic in a half-hour period was 235 vehicles at Fifth Avenue, with the maximum north-south traffic 525 vehicles. However, at Sixth Avenue 222 vehicles moved north and south, with 186 east and west. From the foregoing it is clear that a uniform cycle for the area from 45th Street and Second Avenue to Canal Street on Seventh Avenue must result in a vast amount of delay to traffic movement. The figures also show the unbalanced traffic control conditions with which the operation of street cars on Fourteenth Street have to contend.

Checks show that, in general, fewer vehicles moved in the first 20-second period of the cycle than in the second or third 20-second period. This can be attributed, in part, to the time lost in starting the vehicles in the first period, and, in part, to the fact that the count was timed with the signal lights when, in many cases, the vehicles did not move until signalled by the traffic officer a number of seconds after the green lights came on. After the third and fourth 20-second period, the number of vehicles per 20-second period falls off somewhat, indicating that some of the time of the 140-second north-south signal interval is not being fully utilized because the volume of north or southbound traffic is not sufficient to utilize it.

A signal delay check was made by men riding the street cars and showed that the running time of cars closely approximated the schedule time before the traffic signals began to operate at 8 a.m. The schedule running time is seven minutes from 6 to 7 a.m., nine minutes from 7 a.m. to 7 p.m., and eight minutes after 7 p.m., and the range in the actual running time and total traffic signal delay was as shown in the table. The actual running time was as high as nineteen minutes, while the traffic signal delay was as high as 9½ minutes.



Effect of 220-second traffic signal cycles on movements of street cars on the Fourteenth Street line of the New York Railways

The actual number of cars in the zone closely approximated the number which should be there up to 8 a.m., after which the difference gradually became greater, until at 8:14 a.m. there were 26 cars on the westbound track between First and Seventh Avenues, whereas, based on the number entering the zone each half-hour period on the schedule running time, there should have been 13. On the eastbound track in the afternoon, there should have been 11 cars between Eighth and Second Avenues, while the check showed a total of 25.

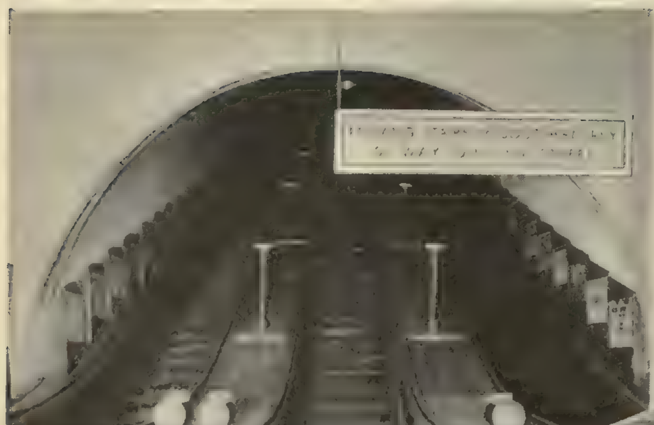
The diagrams reproduced show the effect of the traffic signal cycles of 220 seconds on the operation of the street cars. With normal operation before the signals were put in use, there would be 32 cars on both tracks, or 16 on each track. The succeeding diagram showed the number and spacing of the cars at the end of each successive north-south, (red) signal interval, until the maximum number has been accumulated. At the end of the sixth interval (22 minutes) operation is normal for signal control, at which time 61 cars are needed in the zone, or an increase of 29 cars. These diagrams also show the acute bunching of cars for meeting signal changes.

Counts made show that only 78 cars crossed Fourth Avenue eastbound in the maximum traffic hour, 5 to 6 p.m., and that the maximum number of cars moving on the signal cycle was eight, the average five, and the minimum, three. There were sixteen east-west signal intervals in the maximum hour. To operate 103 cars per hour with this number of signal intervals an average of slightly more than 6.4 cars would have to be moved in each signal interval in groups of six or seven each. Obviously, it is almost impossible to handle street car movements on the basis of six and seven-car berthing.

The first step to bring the track capacity up to the schedule or service requirements will be found in decreasing the average number of cars held by signals. A reduction of two cars per signal interval, 6.4 cars to an average of 4.4 cars, with the input of 103 cars per hour would give about 24 cycles per hour. Without changing the existing 2 to 1 ratio of north-south to east-west intervals the adoption of a 150-second cycle (24 per hour) recommends itself. The north-south traffic can be readily handled with the elimination of the "dark" signals, as there will be 40 additional seconds in each hour for north-south movements. With 95-second north-south intervals there would be more time in each hour for north-south traffic, and there would be 24 opportunities for vehicles to move and gain a fraction of a block while the north-south signal is red. On the present basis of sixteen cycles, a vehicle would travel 144 blocks per hour, and on the 24-cycle basis it would travel 168, an increase of about 16.7 per cent. The movement of all east and westbound traffic will likewise be facilitated, over-all speed will be increased, and delays diminished.

A more frequent movement of pedestrians across the avenue will be secured, and the serious reduction in the number of effective traffic lanes, due to pedestrians stepping out on roadways while awaiting signal change, will be diminished in a degree. The vehicular congestion on principal crosstown streets other than Fourteenth will be relieved, and the movement of street cars on the principal east-west streets will also be improved. The number of cars moving in a group will be reduced, so that there will be better loading conditions, better service given, and the number of cars operated through the zone in an hour can be increased about 15 per cent.

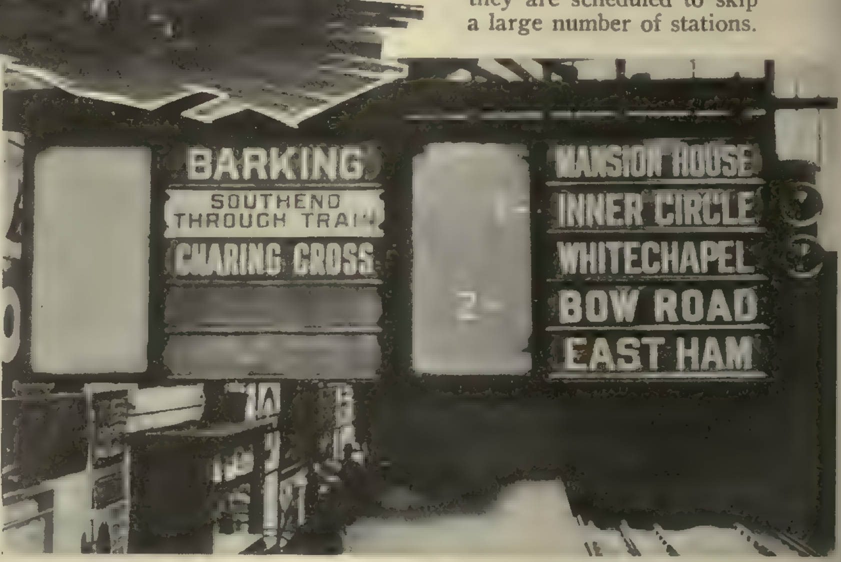
Helping the Patron or London’



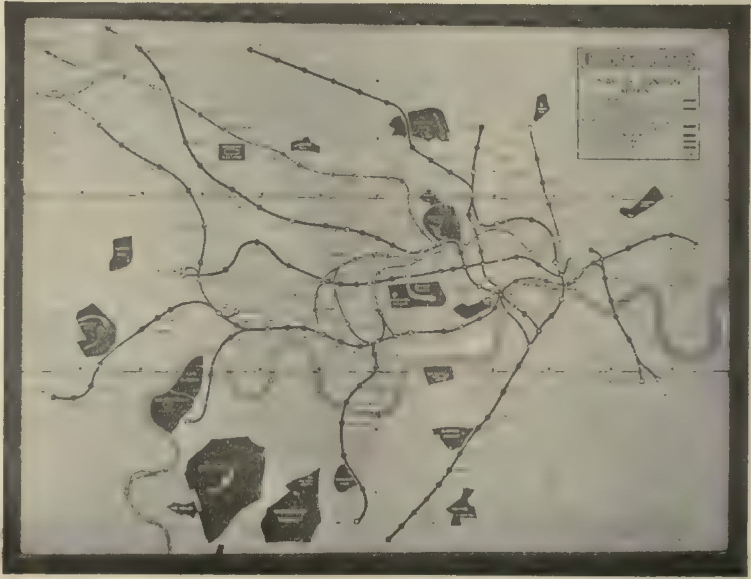
More than three score escalators or moving stairways have helped to solve the problem of bodily transfer of passengers between various subway levels and the sidewalk. This escalator at Waterloo station benefits the many suburban passengers of the electrified Southern Railway.

District Railway (electrified open-cut) trains carry “Non-Stop” signs at the front when they are scheduled to skip a large number of stations.

District Railway non-stop trains carry alongside the center doors (on removable slats) a list of the stations at which these trains do *not* stop. Illuminated station boxes overhead have already given the passenger advance information as to the destination of the train.

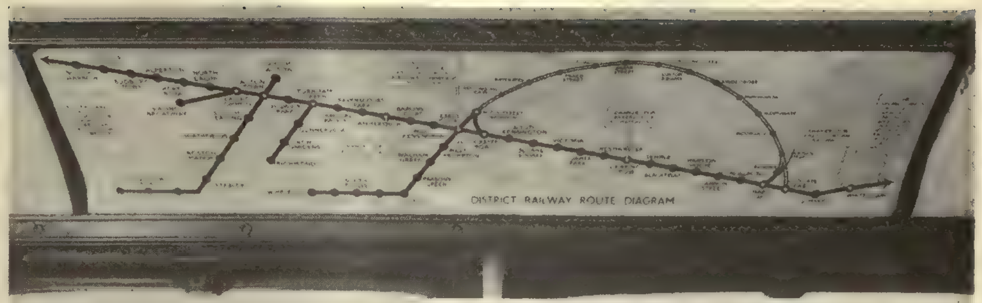


This type of illuminated overhead sign at stations shows the order of incoming trains by means of number and arrow indications.

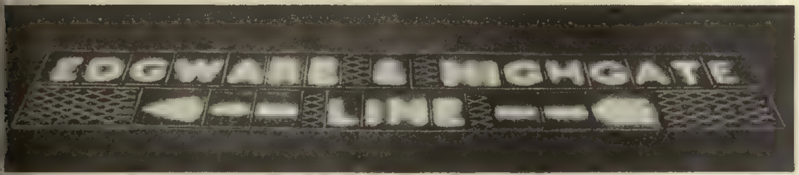


Before deciding on his ride, the prospective passenger can survey this 9 ft.x12 ft. wall map at leisure.

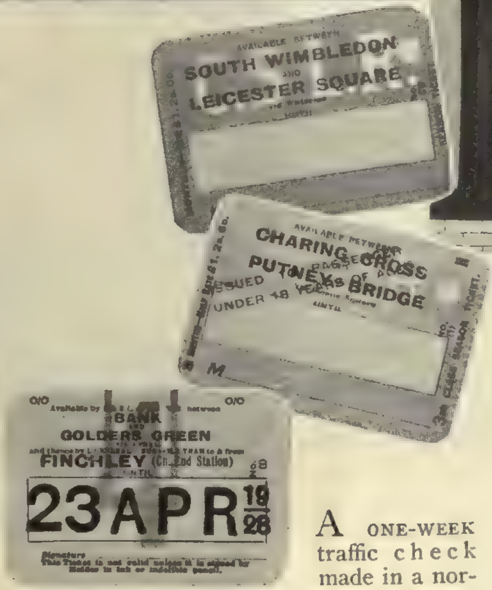
THE ILLUMINATED MAP, formerly hung from the ceiling of "tube" cars, is now being superseded by varnished cards which are carried over the side ventilator sash. This later style of map is shown in this illustration. Note the care given to showing transfer points whether to the company's own or to *foreign* lines.



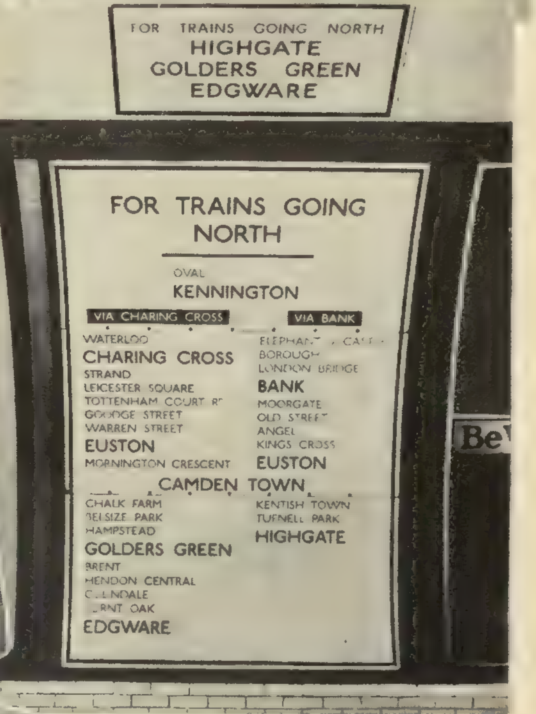
Underground



ELECTRICALLY-LIGHTED SIGNS are sunk in the station platforms and tell the passenger the direction of the train he wishes to take.



A ONE-WEEK traffic check made in a normal winter week indicated that between 15 and 16 per cent of the rides were on weekly, monthly or quarterly passes (seasons).



BEFORE A TRAIN obscures this 7 ft. x10 ft. sign which is attached to the wall of the station opposite the platform edge, the patron can satisfy himself that he is or is not on the right platform. Even if the train is in, he can see the main destinations on the higher 2 ft. 6 in.x5 ft. auxiliary sign.

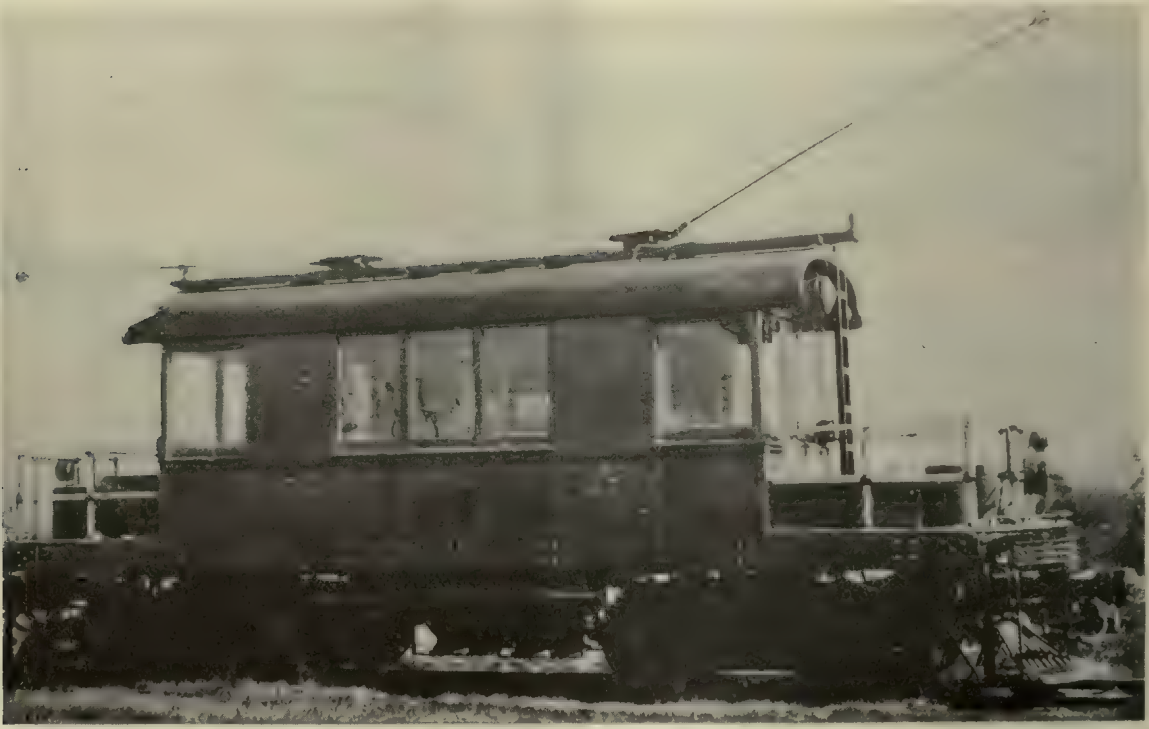
AT MANY STATIONS, the ticket-using passengers are counted through practically noiseless passimeters, but the season ticket or passholder, as shown at the left, merely shows his pass and goes on.

THE CHANGE-MAKING delays associated with zone fares are reduced for pay-each-time passengers by the use of ticket-issuing machines. The later types also make change.

Freight Service

Instituted by Texas Electric Railway

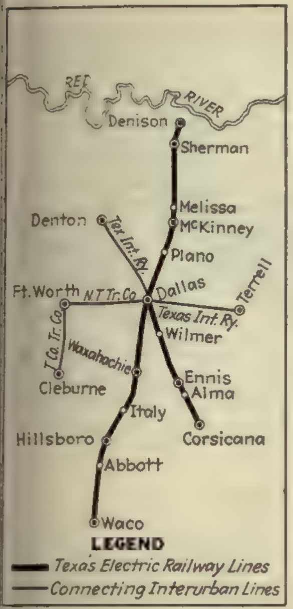
Lines serving a rich agricultural and industrial section are carrying an increasing volume of freight. Equipment has been improved and terminal facilities added to accommodate shippers



Type of electric locomotive used by the Texas Electric Railway. Two are already in service while two more are under construction

ORIGINALLY chartered for giving passenger service only, the Texas Electric Railway, Dallas, Tex., saw the possibilities of handling freight in the rich district it serves and took steps early in 1928 to have the charter amended to permit it to engage in the freight business also. The amendment was made on April 11 and on May 1 the Texas Railroad Commission granted permission for the interurban to handle intrastate freight. The final move came on Nov. 17, when the Interstate Commerce Commission approved the company's rates on interstate shipments. By securing the co-operation of business men in the communities reached and arranging with five steam railroads for interchanging business, the railway had an immediate response when service was started. To accommodate the shippers the company added to and improved its physical facilities in many ways. Loading platforms were built at almost every town; passing tracks laid at several points; station facilities increased; two freight yards added; four new portable substations purchased, and two electric locomotives secured. The railway has benefited from the additions, for the volume of freight carried has increased steadily.

Since 1924 the passenger business of the Texas Electric Railway had been decreasing and losses in passenger revenue became so heavy that communities it served feared there would be a serious curtailment, or possible suspension, of the electric railway passenger service. Company officials, leading citizens of the communities served and numbers of security holders made a thorough analysis of the situation and decided that the company should enter the freight field. Traversing a busy agricultural and industrial section of north central Texas, the lines of the railway offered strategic freight connections for a number of railroads which had difficulty in gaining easy access to several of the larger cities. Because of this the steam railroads with which interchange business was possible, gave helpful assistance in furthering the plans to engage in the freight business.



Lines of the Texas Electric Railway, centering at Dallas, reach Sherman and Denison on the north and Waco and Corsicana on the south. The system also is interconnected with interurbans reaching Fort Worth, Cleburne, Denton and Terrell

The system, with a total of 230 miles of track, centers at Dallas, lines radiating to Denison and Sherman on the north and to Waco and Corsicana on the south. Dallas is the largest inland cotton market in this country and the entire territory served is an important cotton-producing section. The cities and towns along its lines also are the marketing centers for large trade territories, and many manufacturing plants are adjacent to or near the railway's tracks. A number of textile mills are being established in the district and most of these will be served by the railway.

Before plans for the operation of freight service were completed, company officials, community leaders and stockholders made contacts with the principal sources of freight business along its lines and found practically all interests eager to co-operate. In numerous instances it was found that the new arrangement offered material economies to the shipper and greatly decreased the time required to reach the larger centers by existing freight carriers.

Loading Platforms Built and Terminals Improved

Plans to carry freight were rushed so as to take advantage of the movement of the 1928 cotton crop, which started in September. In almost every town, team tracks and cotton loading platforms were built. Numerous passing tracks also were built and station facilities were furnished which were comparable to those maintained by the steam roads. At Waco a complete freight yard, to accommodate twenty freight cars, is under construction. It will have adequate switching tracks, as well as tracks for loading, unloading and storing the cars. At Dallas a new yard to accommodate twelve cars has been built. The Dallas terminal is located near the center of the city at a most accessible point. A large freight station with adequate docks makes the Dallas terminal convenient for business houses in the wholesale and jobbing district where it is located.

Loading cotton, the principal commodity carried by the railway, on a specially constructed platform at Abbott, Tex.

Front view of the Class A electric locomotive used on the system

To provide for the movement of heavy traffic four additional substations of portable type have been built. They are mounted on steel flat cars and have General Electric equipment. One other new substation was installed. Two electric locomotives were built for the company and two additional locomotives are now under construction. Other equipment is being added as required.

Freight interchange tracks have been arranged with five steam railroads at twelve points, as follows: The Missouri, Kansas & Texas Railway, at Denison, Hillsboro, Waco and Kipling, south of Waxahachie; the Southern Pacific, at Melissa, Plano, Wilmer and Alma; the St. Louis & Southwestern, at Plano and Hillsboro; the Trinity & Brazos Valley at Waxahachie; and the International & Great Northern at Italy. Additional interchange tracks are to be built in the larger terminals at Waco, Corsicana, Sherman and Dallas. Industrial tracks have been built to factories along the interurban tracks and others are being built as rapidly as possible. Freight facilities have already been made available to many cotton mills and warehouses, cotton oil mills, brick manufacturing plants and miscellaneous industries. Active efforts also are under way for the location of new manufacturing plants along the company's tracks.

Under the schedule of through rates recently granted by the Interstate Commerce Commission, the Texas

Electric Railway is in position to handle carload and l.c.l. shipments from the Middle West and Eastern states, moving by rail through St. Louis, Kansas City, Memphis, Shreveport and New Orleans. This business has been built up, since the rates were approved, to a point where a large proportion of the shipments now is interstate shipments of carload and l.c.l. lots.

The Electric Express & Baggage Company will continue to handle express service over the lines of the Texas Electric Railway, as in the past. This company also operates over the Texas Interurban Railway, serving Dallas, Terrell and Denton. Regular pick-up and store-door delivery service is maintained by this company.

The development of its freight business has not affected the Texas Electric Railway's passenger service. Regular hourly passenger service is maintained without interruption. A major portion of the freight movement is handled at night, thus causing a minimum of interference with the passenger cars.

The plans for engaging in freight business were inaugurated and carried out by the late Jack Beall, president of the company and J. P. Griffin, vice-president. A. E. Morris, formerly general freight and passenger agent Oklahoma Railway, has been named traffic manager, and M. R. Fewell, formerly general passenger agent Texas Electric Railway, has been made general passenger and freight agent. C. E. Lennon is the assistant general passenger and freight agent.

Employees of Augusta-Aiken Honored

IN RECOGNITION of services rendered the public and the company and for long and faithful employment with the company, the Georgia Power Company, which recently acquired the properties of the Augusta-Aiken Railway & Electric Company, Augusta, Ga., has bestowed service badges upon 80 employees who have been with the Augusta company for ten years and upward. A banquet was tendered all employees at the Partridge Inn, attended by more than a score of prominent officials of the company.

Dresden Articulated Units

TWO articulated street car units have been built and are being tried at Dresden, Germany. They differ somewhat from each other, though each has three bodies. One of these was shown in an illustration appearing on page 23 of the Jan. 5 issue of this paper. One of the units consists of two end cars, each 29 ft. 6 in. over all and mounted on four wheels each, with a central compartment about 13 ft. 4 in. over all, supported by the end cars. The over-all length of this unit is 72 ft. 4 in.

The other design is 73 ft. $5\frac{1}{2}$ in. over all, with the end cars 24 ft. 4 in., and the central car 24 ft. 9 in. in length. The method of support, however, is entirely different. In this second design the central unit is mounted on a single truck, and the outer end of each end unit is equipped with two wheels only, with a support swiveled from the central truck.

When empty each articulated unit weighs about 63,800 lb. It has a carrying capacity of 117 seated and standing passengers. In each train every axle is fitted with a motor, making four motors per articulated unit. They will be tried out first on heavy traffic interurban lines.

Bolt holes were reamed with an electric drill and $1\frac{1}{8}$-in. reamer

Building City Track for Heavy Cars

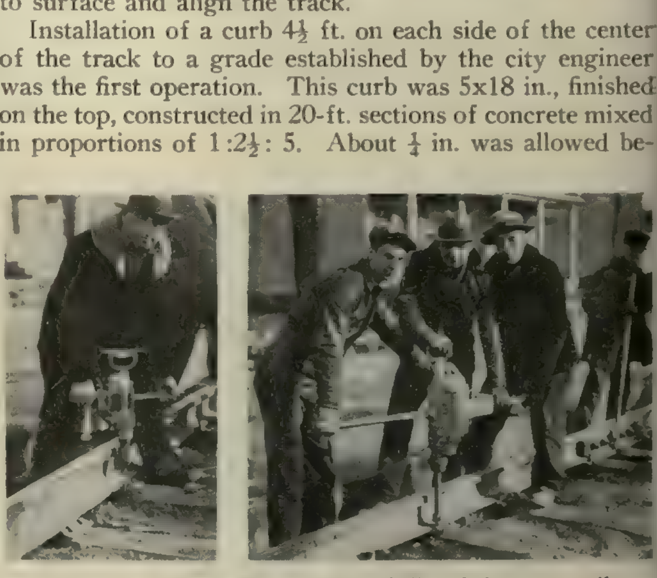
By JOHN F. HUBENTHAL,

Roadmaster Chicago, South Shore & South Bend Railroad

HEAVY trains, such as employed by a number of interurban railways, require track construction designed to withstand severe abuse with reasonable maintenance cost. These requirements are doubly necessary where such lines run through paved city streets. The Chicago, South Shore & South Bend Railroad has installed track in Michigan City, Ind., which is believed to meet these requirements. This track is constructed with section 13025 rail in 66-ft. lengths. The joints are of the Chicago, Milwaukee, St. Paul & Pacific Railroad type, 38 in. long, punched for six $1\frac{1}{8}$-in. bolts spaced $5\frac{1}{2}$ in. on centers, bolts being $1\frac{1}{8}$x$6\frac{1}{2}$ in. using $1\frac{5}{32}$-in. Hi-Power lock washers. The tie plates are double shoulder inclined and the joint plates are shoulderless inclined, 40 in. long. Both are punched for screw spikes. The pavement used is Tarmac, penetration process, bituminous concrete.

Numerous construction obstacles were encountered on this installation. Due to lack of space all materials had to be unloaded beyond the curb line in places where permission to do so could be obtained, and then moved by truck to the locations needed. The work was performed by three separate crews. The large crew laying rail was followed by a smaller crew, to place and space the ties and the tie and joint plates, and by a surfacing crew, to surface and align the track.

Installation of a curb $4\frac{1}{2}$ ft. on each side of the center of the track to a grade established by the city engineer was the first operation. This curb was 5x18 in., finished on the top, constructed in 20-ft. sections of concrete mixed in proportions of $1:2\frac{1}{2}:5$. About $\frac{1}{4}$ in. was allowed be-



Holes were drilled with an electric drill and the screw spikes placed with a spike driver

The track was surfaced and aligned by means of a Buff Railign instrument

The ties were tamped by the use of electric tamping machines

tween blocks for expansion. The joints were so constructed that one block would help support the adjacent block.

The large crew then laid the rail and installed the joints. As these joints were drive-fit it was necessary to have them in good surface and line, and drifted to equalize hole spacing, before attempting to install the bolts. If the holes did not line up so that the bolts could be driven without spoiling the threads the holes were reamed, an electric drill and 1⅛ in. reamer being used for the purpose.

Immediately following this came the job of renewing and spacing the ties on 22-in. centers, or 36 ties to each 66-ft. section, with three joint supporting ties spaced slightly closer to give full bearing to the face plates. The tie and joint plates were spaced and temporarily spiked to gage with track spikes. The spike holes were then drilled and spikes driven by a No. 4 B spike driver. The same crew also tightened the bolts by tapping the head with a spike maul, while the nut was tightened with a wrench. This was done three times before the track was paved.

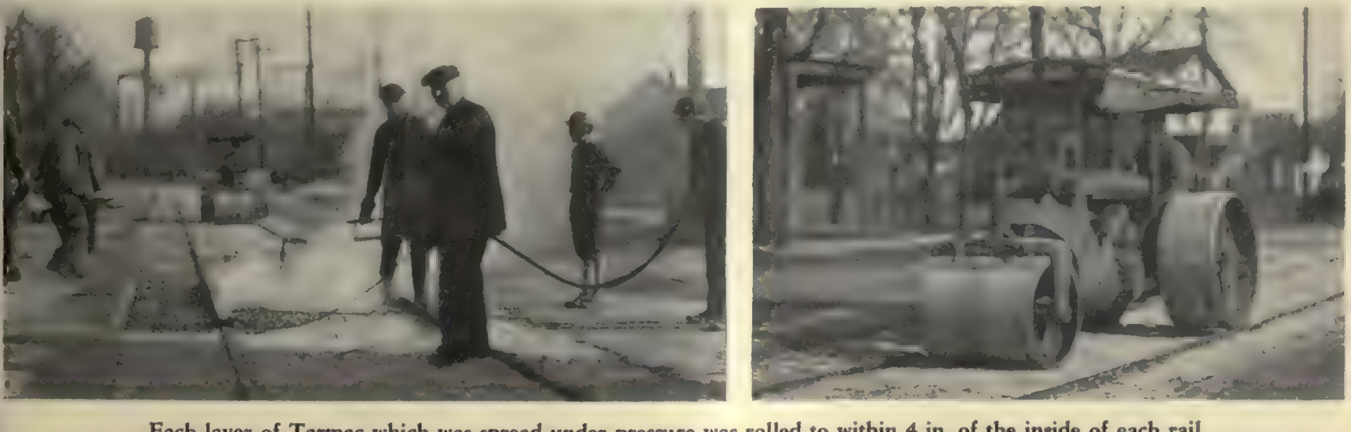
Then followed the crew which surfaced and aligned the track by using a Buff Railign instrument, operated by the foreman. The ties were tamped by the use of electric tamping machines. After the track was surfaced and aligned it was then backfilled with the gravel previously removed. This fill was installed in layers of 3 in. each and hand-rammed until it became thoroughly compact.

Joints were then cleaned with a wire brush in preparation for welding. The rails were heated with kerosene torches about 2 ft. on each side of the joints to close the expansion gap. If the rails failed to close with this heating an insert was made to fill the space and the joints seam-welded to the joint plates and ball of the rail. The rails were also electrically welded together and finished to a smooth surface with a grinder.

Because the rigidity of concrete paving was considered undesirable, macadam paving was used, and the Tarmac penetration process was selected. Four different grades of stone were used in this paving, namely, No. 4, No. 3, ½-in. chips and screenings. They were installed in layers in the order mentioned, and between each layer Tarmac was applied under pressure.

The Tarmac was heated to a temperature varying from 280 deg. to 300 deg. After each layer was applied it was rolled with a gasoline driven roller. Precaution was taken to leave unrolled a strip approximately 4 in. inside of each rail, since this was to be tamped by the flange of the car wheels.

Stone for paving was unloaded from drop-bottom cars

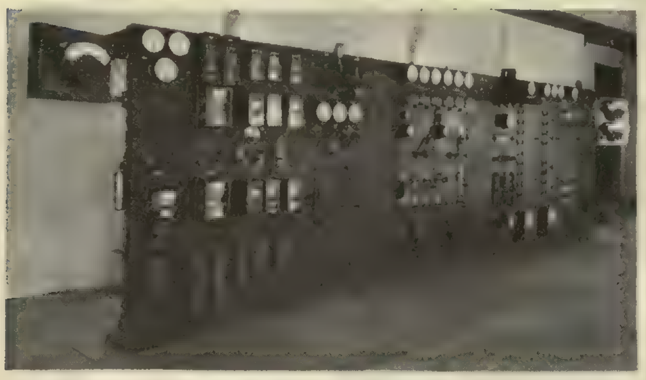


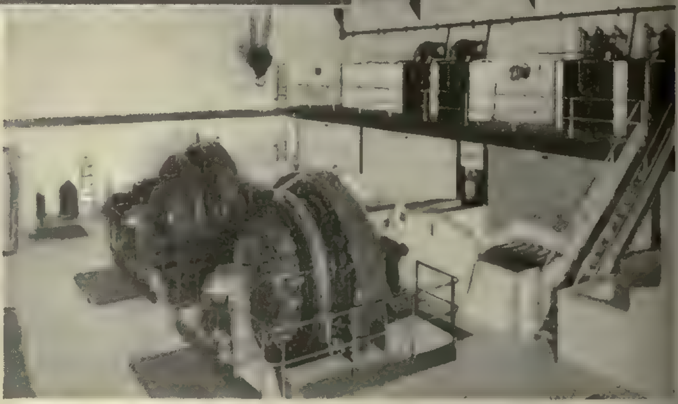
Each layer of Tarmac which was spread under pressure was rolled to within 4 in. of the inside of each rail

Views of Electrical Equipment for Philadelphia Subway

The architecture of this substation, typical of all three, makes the building a distinct asset to the neighborhood in which it is located. Station noise is minimized by making the building entirely closed

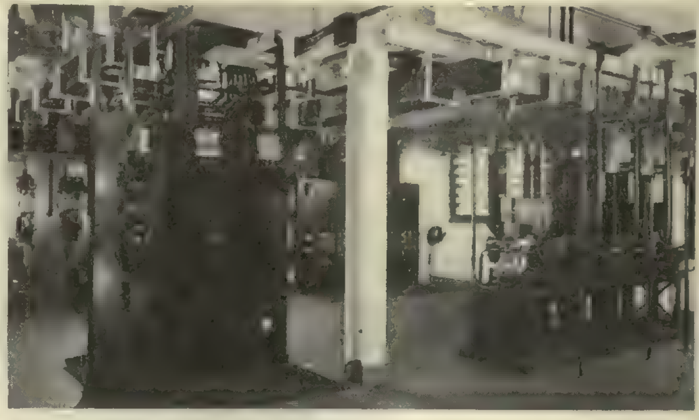
Main control switchboard of the Louden Street substation



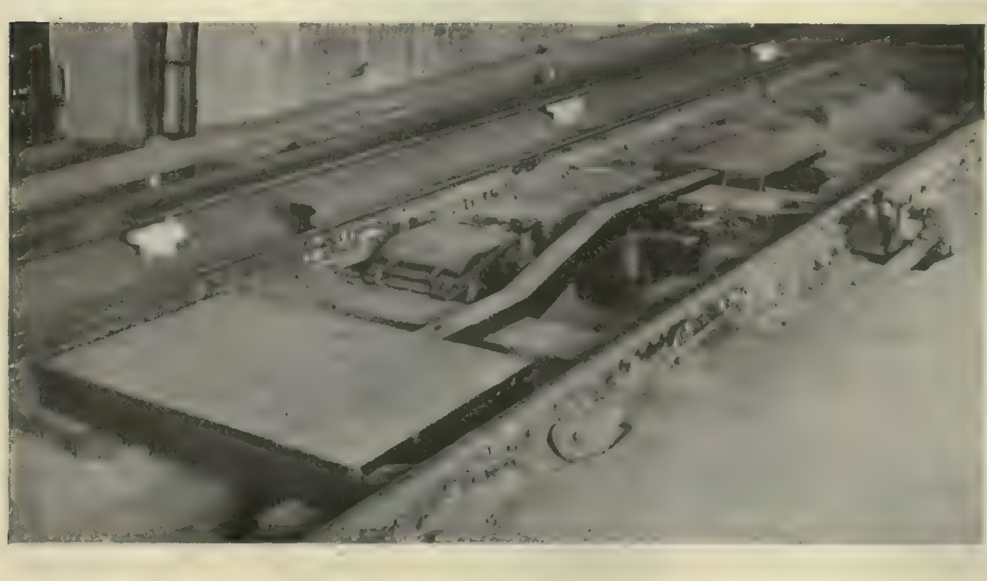


Interior of the Cumberland substation, showing the large synchronous converters. The transformers are housed in the pits at the right of the converters

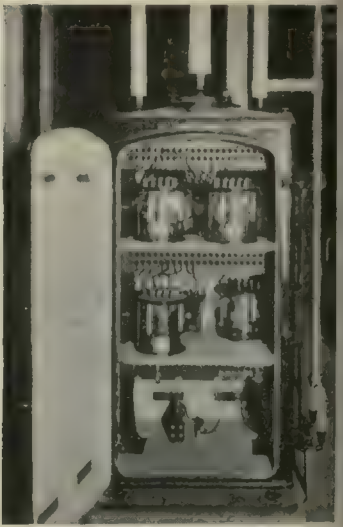
Basement of the Cumberland substation. An individual converter switchboard may be seen at the left and a battery of high-speed circuit breakers at the right



Double automatic stop layout and impedance bonds. Both automatic and semiautomatic train stops have been provided to operate in connection with every automatic block signal and interlocking home signal



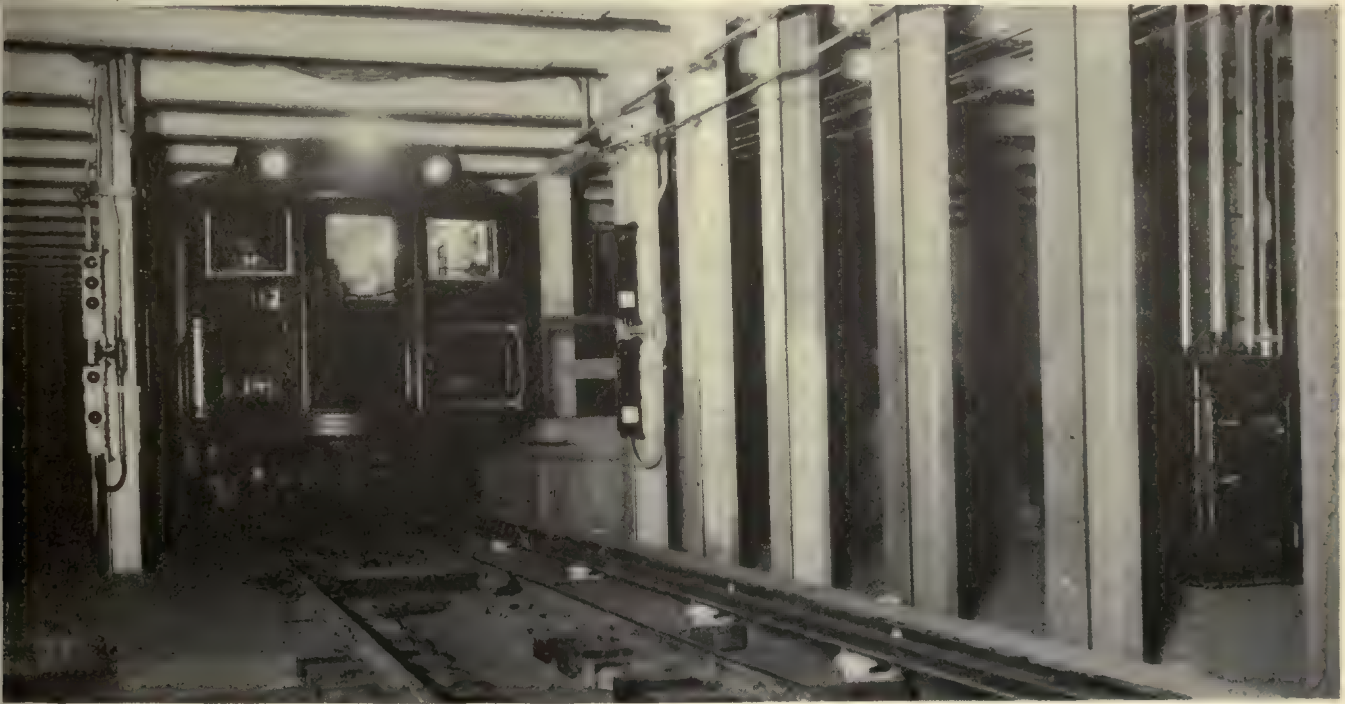
Instrument case, showing typical piping to the stop-valve magnets



Electrical Equipment

Specially Designed for Philadelphia Subway

Two 3,000-kw., 60-cycle rotary converters have been installed in each of three soundproof substations. Distribution system utilizes a total of 75 miles of cable. Signals are electric color-light type and all switches are interlocked and electro-pneumatically operated



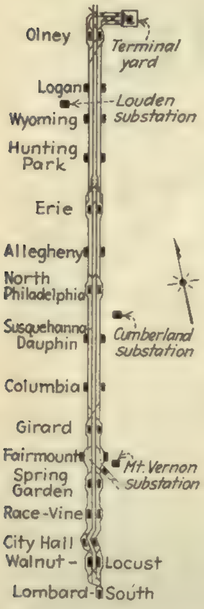
Signal location at Olney Avenue, showing the conduit run and the relative location of signals. Note the double case at the right and the method of running air line across track

In the Feb. 9 issue an article was published telling the relation of the Broad Street subway to the existing and the future transit facilities of the city, and giving operating and construction details. This was followed by an article in the Feb. 23 issue describing the 150 cars bought by the city. The last article of this series, giving details of the Fern Rock terminal and shops, will appear March 23.—Editor.

NUMEROUS noteworthy features have been included in the design of the power distribution system for the new Broad Street subway, constructed under the supervision of the Department of City Transit of Philadelphia and being operated by the Philadelphia Rapid Transit Company. Among these are the construction of the substations without windows; the scheme of natural ventilation for the removal of the air heated by the electrical equipment; the largest 60-cycle railway converters ever built; the remote manual control and interlocking of electric switches; the separation of high-voltage circuits and switching from the low-voltage direct-current circuits; location of all 600-volt circuits below the main floor; the bringing of underground cables directly to the switching equipment to which they connect; and the use of large oil cooled transformers within the buildings.

The signal system, too, has many interesting features. The salient ones are: Alternating current at 60 cycles for signals and interlockings, supplied by a system of duplicate feeders; the double-rail track circuits, except at interlockings and in the yard; overlap signal control; automatic three-position, color-light signals; electro-pneumatic automatic train stops; semi-automatic electrically-controlled block and interlocking signals; non-automatic electrically controlled dwarf and permissive signals; speed and time control signals; electro-pneumatic switch operating mechanism; impedance bonds and track connections; interlocking machines; and electro-pneumatic direct acting yard switches, operated from a control panel in a tower.

In the determination of substation capacities and locations, the ultimate power demand of the trains was used

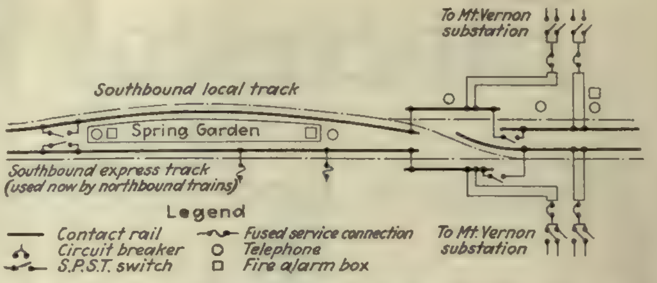


Three substations, spaced approximately 2 miles apart, serve the Broad Street subway

as a basis. Rush-hour operation was assumed to consist of eight-car trains running on two-minute headway on all four tracks, with northbound trains carrying an average load of 150 passengers per car (72,000 per hour) and southbound trains loaded to an average of 35 passengers per car. As northbound trains run against the average grade, the evening rush hours were used in determining the maximum substation loads.

With the above train operation, including coasting, which provided a 5 per cent speed margin, a schedule was developed assuming a loaded car weighing 68 tons accelerating at an average rate of 1.6 m.p.h.p.s. and braking at an average of 2.0 m.p.h.p.s., and train curves were drawn for an average run using characteristic curves of standard motors of various sizes. The results of these calculations fixed the motor requirements at approximately 400 hp. per car, and because of the obvious advantages of large motors it was decided to use two motors only on each car. Having determined the proper motor size, continuous train curves for northbound and southbound local and express trains were then drawn, assuming an average potential of 575 volts at the cars. Studies of various numbers and locations of substations were made from the power requirements as shown by these curves.

Past experience with a four-track subway rapid transit line, similar to the Broad Street subway, indicated that the feeder capacities and voltage drops during peak loads are within satisfactory limits when substations are spaced about two miles apart. The results of the power requirement studies for the Broad Street subway agreed with this experience. Considering the first section of the Broad Street subway with a branch on Ridge Avenue, it appeared logical to locate a substation near this junction and the Mount Vernon Street site was chosen. This substation carries the load of two-track initial operation from City Hall, a distance of approximately 4,400 ft., south, to the first sectionalizing joint, about a mile north of the substation. By the time traffic requires four-track operation through City Hall, the subway will be extended to South Street and another substation will be located in that vicinity.

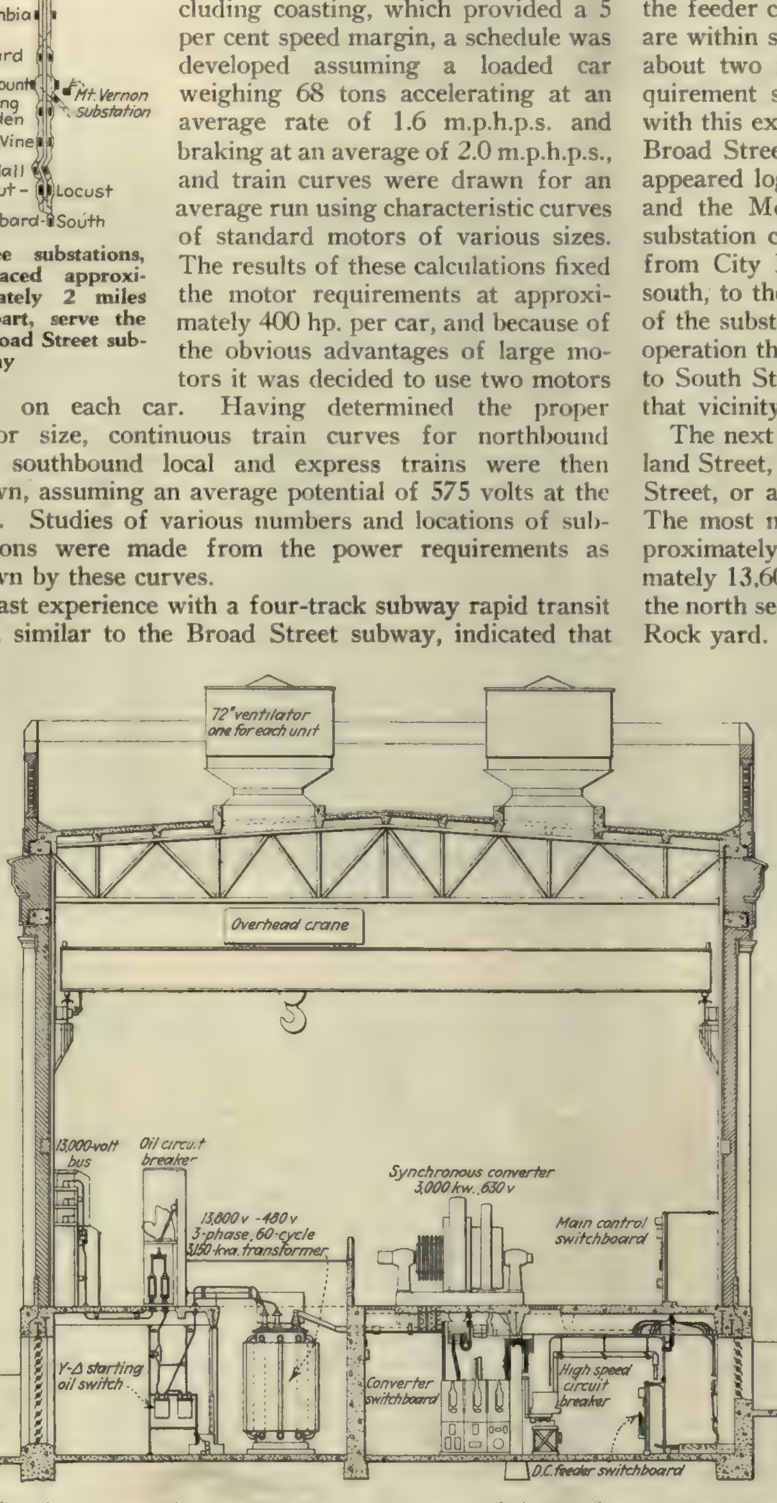


Typical layout of contact rails at a station, and how they are fed by the substation cables

The next substation to the north is located on Cumberland Street, approximately 10,000 ft. from Mount Vernon Street, or approximately 10,600 ft. between substations. The most northerly substation is on Louden Street, approximately 13,000 ft. from Cumberland, or approximately 13,600 ft. between substations. This station feeds the north section of the subway and also supplies the Fern Rock yard. The method used in calculating the loads on the substations made it possible to determine not only the load on each substation during the maximum hour, but also the peak loads on each track during any five-second period, either assuming all trains to be exactly on schedule or assuming certain trains to be late. Various "off schedule" combinations were tried, but it was decided to assume all trains exactly on schedule, and also that the peaks occurred simultaneously on all tracks, the improbability of the occurrence of the latter condition giving sufficient margin over the calculated load to care for the possible higher peaks within the five-second period. The substation loads, as calculated by the above method, were as follows:

	Maximum Hourly Load, Kw.	Momentary Peak Load, Kw.
Mount Vernon............	9,700	21,600
Cumberland.............	9,500	21,700
Louden...............	9,500	20,500

Since the momentary peak loads are more than twice the maximum hour loads, and since the two-hour rating of synchronous converters is generally 150 per cent of the continuous rating, it is evident that the requirements called for converters having at least a five-second

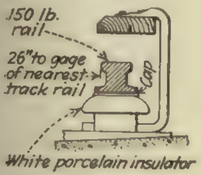

72" ventilator one for each unit
Overhead crane
13,000-volt bus
Oil circuit breaker
13,800 v -480 v 3-phase, 60-cycle 3150-kva. transformer
Synchronous converter 3,000 kw., 630 v
Main control switchboard
Y-Δ starting oil switch
Converter switchboard
High speed circuit breaker
D.C. feeder switchboard

Substation cross-section, showing the arrangement of the synchronous converters, transformers and other electrical equipment

rating of 300 per cent of their continuous capacity. The converters installed have a continuous rating of 3,000 kw. with 150 per cent capacity for two hours, and 300 per cent for three minutes. The number of converters to be installed in each substation for the ultimate capacity of the subway will be four. This includes one spare in each station. For the initial two-track operation two converters have been installed in each substation. These will easily take care of the estimated loads for the year 1930, when the schedule has been assumed as six-car trains operating on a two-minute headway.

All Power Purchased

Power for the operation of the Broad Street subway is purchased from the Philadelphia Electric Company at 13,200 volts, three phase, 60 cycles. To minimize the danger of a complete shutdown of the subway due to loss of power, each substation is supplied directly from a different generating station and, since any two substations are sufficient to enable trains to continue in operation at reduced speed, the chances of a complete shutdown from this cause are extremely remote.

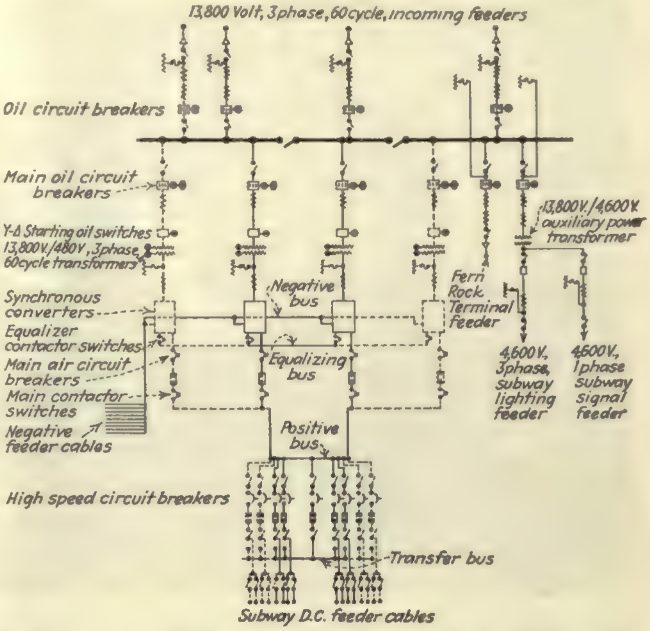


Cross-section of the 150-lb. over-running type of contact rail and the horizontal protecting board

The Louden substation is fed from the Richmond generating station; the Cumberland substation from the Hunting Park substation of the Philadelphia Electric Company, which is now supplied from Conowingo; and the Mount Vernon substation from the Delaware generating station. The power cables, both incoming and outgoing, are all in underground conduit, and the alternating current is, in every instance, carried over duplicate three-phase cables, either one of which is capable of carrying the normal two-track load.

On account of the location of the substations in residential districts, their architecture was given special attention. Noise is minimized by making the buildings entirely closed, except for the cold air louvers, and providing air spaces in the walls.

In the arrangement of the equipment in the substations, safety and ease of operation were sought, and, consequently, all power circuits were located below the level of the main floor. Each incoming alternating-current feeder is carried directly to disconnecting switches, then through an oil circuit breaker to other disconnecting switches, and then to the 13,200-volt alternating-current bus. Each converter transformer is fed from this bus through disconnecting switches, a main oil circuit breaker and star-delta starting switches. Copper bars from the transformer secondaries lead directly to the alternating-current ends of the synchronous converters. At the direct-current end of the converters, the negative is tied solid to the negative bus. The positive and equalizer connections are carried through circuit breakers or contactors on the converter switchboard, which is in the basement below, thence to their respective buses located adjacent to this switchboard. From the positive bus the contact rail feeder circuits are carried through high speed circuit breakers, then through disconnecting switch panels to the feeder cables which leave the building on the side opposite to the incoming alternating-current cables. All control and switching equipment was supplied by the General Electric Company, with the exception of the main direct-current circuit breakers, which were built by the I. T. E. Circuit Breaker Company.


13,800 Volt, 3 phase, 60 cycle, incoming feeders
Oil circuit breakers
Main oil circuit breakers
Y-Δ Starting oil switches
13,800 V./480 V., 3 phase, 60 cycle transformers
Synchronous converters
Equalizer contactor switches
Main air circuit breakers
Main contactor switches
Negative feeder cables
Negative bus
Equalizing bus
Positive bus
High speed circuit breakers
Transfer bus
Subway D.C. feeder cables
Fern Rock Terminal feeder
13,800 V./4,600 V. auxiliary power transformer
4,600 V., 3 phase, subway lighting feeder
4,600 V., 1 phase subway signal feeder

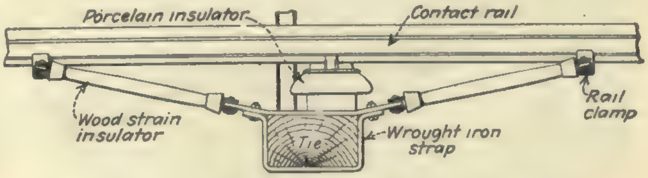
Wiring diagram for one of the stations. The solid lines show the present installation, while the broken lines represent equipment to be added later

The converters, built by the Allis-Chalmers Manufacturing Company, are compound-wound, 60-cycle, interpole machines and are the largest of this type ever built. These converters are started by star-delta switching of the high-tension windings of the transformers. All switching and starting operations are so interlocked as to make improper sequence impossible. In addition to their size, they have another unusual feature in the armature windings. These windings are of the so-called "frog-leg" type, which consists of a combination of lap and wave windings, thus eliminating the necessity for cross connections. The transformers supplying the converters are rated at 3,150 kva. at 13,800 volts and are three-phase, 60-cycle oil-cooled, the latter feature being a departure from the usual practice of using air-cooled transformers in similar installations. They were furnished by Allis-Chalmers Manufacturing Co.

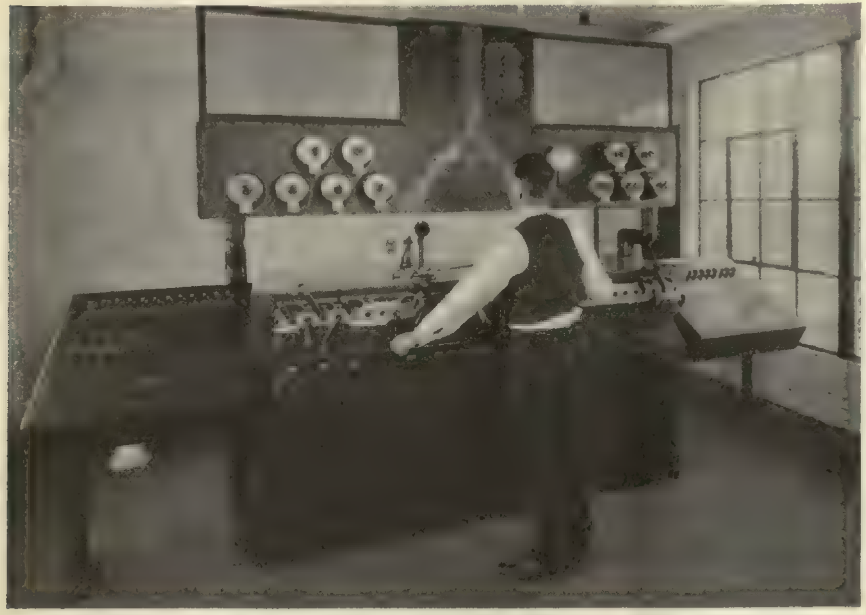
Another unusual feature is the remote control of all switches in the power circuits. The operators do not handle any switches carrying train power current, as these switches are all located in the basement and controlled from the switchboard on the main floor.

Power Distribution Through Underground Conduits

Power is carried from the three substations to the subway in underground conduits. For initial two-track operation there are eight 2,000,000-circ.mil cables on the positive side and six 2,000,000-circ.mil cables on the negative side of the circuit from each substation. For the ultimate four-track operation the number of these cables will be doubled. When the subway structure was built, provision was made for these duplicate underground con-



The contact rails are anchored in 1,000-ft. sections with this type of anchor

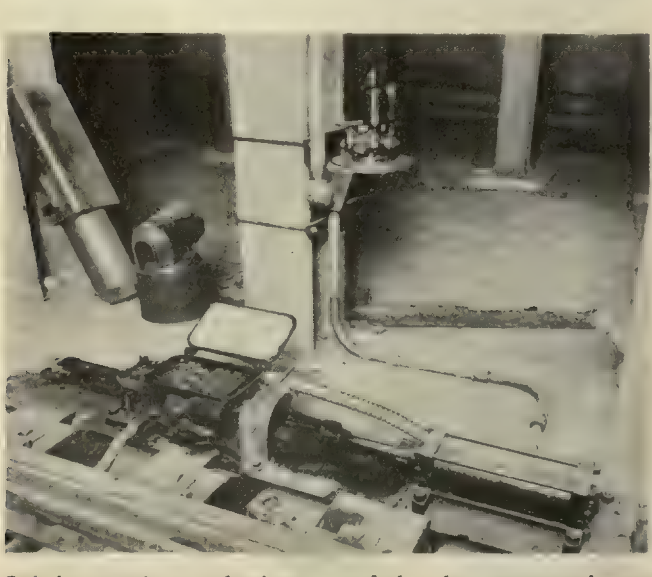


Interlocking machine at yard portal for switches on the main track. Note the control panel at each end for controlling yard switches, the track model showing the main track layout and framed charts on each end showing the respective yard layouts

duit lines with manholes communicating with the inside of the subway. Each section of this duplicate system is entirely isolated from the other, and for important services like lighting and signals, duplicate feeder cables have been installed. Paper-insulated, lead sheath protected cables, thoroughly fireproofed in the manholes, are used for all of the underground circuits. In the 6½ miles of subway, there are thirteen kinds of cable with an aggregate length of approximately 75 miles.

Switching rooms are provided in Broad Street at the streets on which the substations are located, and the positive cables from the substations are tied in with the contact rail through remote controlled circuit breakers located in these rooms in the subway retaining walls.

From the switching rooms two 2,000,000-circ.mil cables are run to each contact rail section. The contact rail is of the over-running type, in 39-ft. lengths, weighs 150 lb. per yard, is of special section and is made of soft steel composition having high conductivity, the ratio of steel to copper being 7 to 1. No cable feeders parallel to rails are used in either positive or negative circuits. The rail is carried on Ohio Brass white porcelain insulators mounted on long ties located at 9-ft. 9½-in. intervals and anchored in approximately 1,000-ft. sections, with expansion joints separating the sections. White glaze was adopted as an aid in checking foreign deposits on the insulators, which are a common cause of leaks. It was thought that this glaze would encourage maintainers to keep the insulators clean. The bonding of the contact rail is accomplished by bolting on two O-B solid copper fish-plates at each joint and by welding adjoining rail heads. The copper fish-plates are then soldered to the webs of the adjoining rails.



Switch operating mechanisms are of the electro-pneumatic type with electrically-operated cut-off valves

The return circuit in the subway is through 62-ft., 100-lb. running rails. Each joint is bonded with two Ohio Brass 250,000-circ.mil. gas-welded bonds, 13½ in. long. Due to the short lengths of the running and contact rail bonds and the high electrical efficiency of the welded and soldered connections to the rails, the conductivity of the entire circuit approximates that of continuous rail, thereby reducing to a minimum the voltage drop. The tracks are cross-bonded at each passenger station, and at the yard portals. In normal operation all sectionalizing and equalizing switches will be kept closed, thus tying the three substations solidly together through the contact rails. Sectionalizing switches are located at substation feed-ins, while equalizing switching points are midway between substations, at the portal and at City Hall. The breakers located at feed-in points are automatic opening, remote control closing, 3,000-amp. rating. Thus they will open on an overload or short circuit, but cannot be closed except by a substation operator.

SIGNAL SYSTEM OF LATEST DESIGN

Electrical energy for the operation of the signal system is supplied from the Mount Vernon and Louden substations. The supply from the Louden Street substation may be considered an emergency source of energy. Normally the energy is taken from one set of feeders, but duplicate distribution cables are installed on either side of the subway structure and may be sectionalized at each substation. Sectionalizing switches are provided at each 4,600/110 volt distribution transformer location along the line and 110-volt automatic selector switches are installed so that, in event of failure of a feeder or local transformer, the signal load for that section will be automatically thrown over to the duplicate service and automatically restored to the original source when that line is again energized. The signal power requirements for the ultimate four-track installation total about 65 kva.

Studies were made of roadway, signal equipment and train-operating characteristics, so that signals might be located to provide maximum train capacity of tracks. These elements included profile and alignment of roadway, location of stations and interlocking plants, acceleration and braking rates, speed-time and time-distance curves, and the normal and maximum attainable speeds for each run for the equipment to be operated, as well as the visibility of the signals and the simplicity of the scheme of aspects displayed by them.

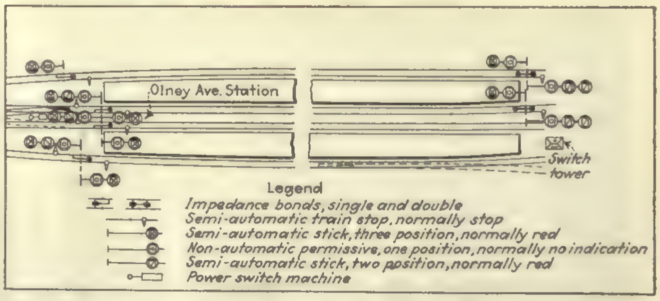
The signal locations or block spacings are laid out for eight-car trains operating on a two-minute headway, although the majority of spacings allow for somewhat less than 1½-minute headway, thus providing for a normal single-track capacity of approximately 23 eight-car trains on the line, operating at a round trip scheduled speed of 16½ m.p.h. In every instance the length of a block is 150 per cent of the emergency braking distance required by the train, at the maximum speed which can be obtained at that point.

Types of Signals and Track Equipment Installed

The automatic signals are from the Union Switch & Signal Company, and are the three-indication, color-light type, equipped with 5⅜-in. lenses of green yellow and red, and 14-volt, 5-watt lamps in duplicate. Home signals at interlocking plants are of the two and three-indication subway style, color-light type, with the same lens and lamp equipment, and displaying two or three lights in a vertical row to indicate which route is set up, and whether or not the track ahead is occupied. In all cases the caution control of a signal is carried in the two blocks in advance, so as to obtain "overlap control," providing for two red signals protecting the rear of a train at all times. A double-arm, interlocking signal, with a yellow permissive signal is used in locations where operation is in both directions.

Speed control signals have been placed on the southbound track south of Olney Avenue, where a long 3-per cent down grade is encountered, on the southbound track leading off the upper deck at Erie Avenue to take care of a 3½-per cent grade, and at several other locations where curves make automatic speed control desirable.

Automatic and semi-automatic train stops have been installed to operate in connection with every automatic block signal and with interlocking home signals. The stops are of the trip type and are located on the left side of the track approximately opposite the signal with which it operates. A trip arm extends 2½ in. above the top of the running rail when in the engaging position, which is when the signal is displaying its most restrictive aspect. When in this position the trip arm will engage a trip cock located on the main air line on the cars, thus causing an emergency application of the brakes of the train which passes the stop. A push-button switch within reach of the motorman's cab is provided at each automatic stop, which is used to clear the trip arm when it is necessary for a train to pass a stop signal.


Olney Ave. Station
Switch tower
Legend
Impedance bonds, single and double
Semi-automatic train stop, normally stop
Semi-automatic stick, three position, normally red
Non-automatic permissive, one position, normally no indication
Semi-automatic stick, two position, normally red
Power switch machine

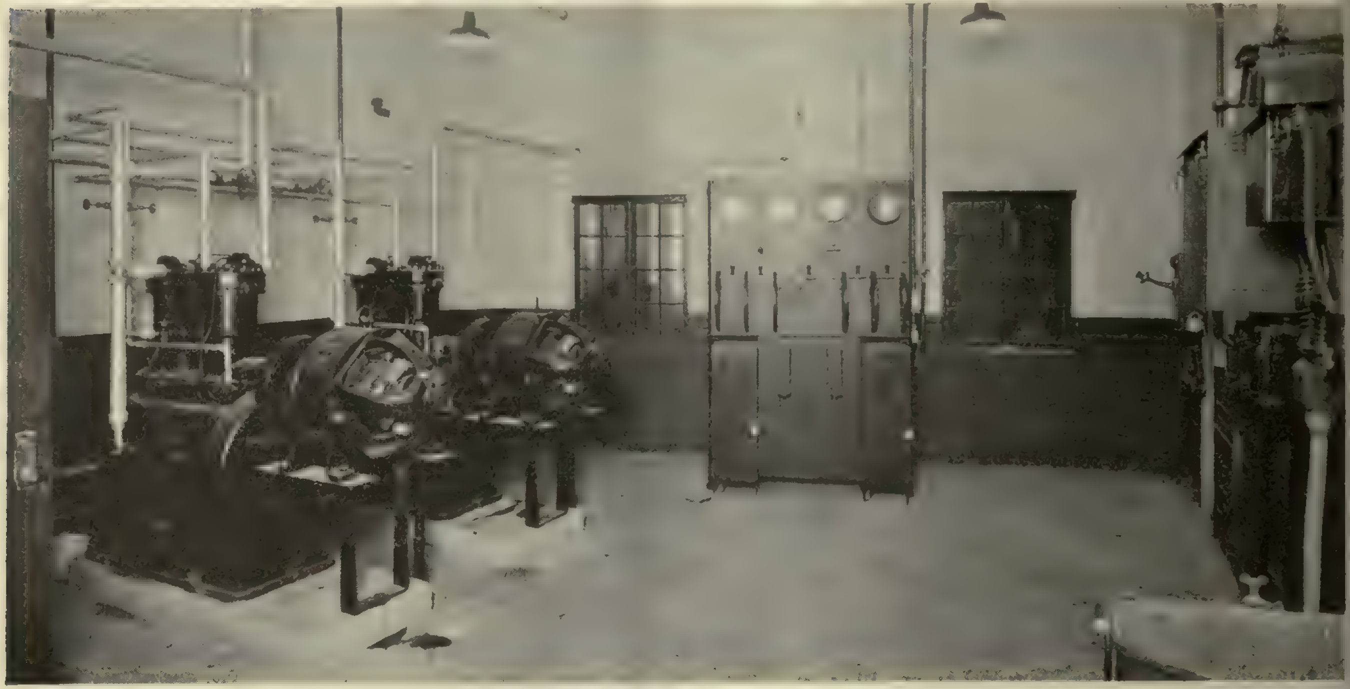
Layout of signals, train stops, power switch machines and other controlling equipment at a typical station

The automatic stop is of the electro-pneumatic type, controlled by an electrically-operated valve. Its operation is positive and in event of failure of electric or pneumatic power the trip arm assumes the engaging position, thus making the signal system safe.

All track circuits are a full block long except where cut sections are required and within interlocking plant limits. Alternating current is supplied at one end of each track circuit, the limits of which are established by insulated joints in the rails, by a 14-volt air-cooled transformer equipped with taps to permit fine voltage adjustment. The track relay is of the two-element, two-position vane type. Track connections are made through parkway type cables buried in the concrete with leads connected to the rail lugs of impedance bonds or the rail.

On double-rail track circuit sections of the system, impedance bonds with an iron core are provided to carry the propulsion current around the insulated rail joints. These bonds have a continuous carrying capacity per rail of 750 amp., 2,000 amp. for ten minutes, or 5,000 amp. for one minute. To avoid the use of a large number of impedance bonds on short track circuits at the large interlocking plants and in the terminal yard,

South portal at the terminal yard, showing the types of signals governing momevents into the subway proper



One of the six compressor rooms located on the system. This view shows the automatic transfer panel, the oil switches, transformers, control board for compressors, the governors immediately below the switches, the automatic starters at each end of the control board and the compressor piping

only one rail is used for the propulsion current and the other is bonded and insulated for the signal track circuit.

Signal control apparatus is housed in cast-iron boxes of 2, 4, 6, or 12-relay capacity located in the vicinity of the signal, controlled and connected to it by conductor cable in galvanized conduit. Signal control cables are run in a three-way duct bench on both sides of the subway.

The switch operating mechanisms are the Union Switch & Signal Company electro-pneumatic type with electrically-operated cut-off valves. Their operation is positive and a movement from normal to reverse can be made in 1½ seconds with air pressure as low as 75 per cent of normal. A means of operating them by hand is provided for emergency.

Compressor plants are located at Fairmount Avenue, Erie Avenue, Olney Avenue, and the terminal yard portal, each having a capacity of 75 cu.ft. of air per minute, excepting the one at the yard, which has a capacity of 100 cu.ft. per minute. All of these compressors are in duplicate and are driven by direct-current series-wound motors designed to operate from the 630-volt contact rail circuit. Each plant is equipped with condensers, main reservoir, and switch panel containing a watthour meter, ammeter, volmeter, air-pressure gage and various switches.

A 2-in. galvanized extra heavy wrought iron pipe is used for the main air line in the subway and yard. Suitable bends for expansion, auxiliary reservoirs for drainage, ¾-in. taps for switches at interlockings, etc., ½-in. taps for automatic train stops, and service taps for track repairs are included.

Six Interlocking Stations

The interlocking plants are located at six points on the system: at the City Hall, Spring Garden, Girard, Erie and Olney stations, and at the yard portal. The plants are pneumatically operated and electrically controlled. The power interlocking machines, built by the Union Switch & Signal Company, range in size from 7 to 75 levers. All of the machines, with the exception of that at City Hall which is temporary, have been provided with sufficient spare space for ultimate four-track operation. The levers are equipped with circuit controllers, indication magnets, electric locks, mechanical locking, and lever lights. The interlocking machine is inclosed in a metal case having separate removable panels for each section.

The position of trains is indicated to the tower man on a track model board, located above the machine, by means of spot lights marking the sections of track within the plant limits and adjacent thereto. A steel relay cabinet with glass-paneled doors is provided in each interlocking station for the purpose of housing such relays, transformers, etc., as may be required for each interlocking plant.

Mechanical locking is used in the interlocking machines, the levers operating in a predetermined order so as to prevent the setting up of conflicting routes or the clearing of opposing signals, and the switches are locked electrically by the presence of a train upon a given track circuit. The electro-pneumatic interlocking is so arranged that with normal operation it is not possible for the operator to set up routes and signals which will permit trains to come together.

In the terminal yard the track switches are electro-pneumatically operated and controlled from a tower in the yard entrance building. The switch mechanisms are not interlocked and depend upon air pressure to keep them in position. They are positive in operation and very rapid in movement, only one second being required for a movement from normal to reverse, or vice-versa. The control panel is equipped with spotlight indicators above each lever. Electrically lighted switch signals are provided to indicate the position of the switch and are controlled by a circuit controller which operates with the switch points. The wiring for the various controls is carried throughout the yard in treated trunking, supported every 7 ft. on concrete piers which also carry the 2-in. main air line.

Loud speaking stationary post telephones are located at

Three tiers of tower relay cabinets installed at the Olney station interlocking plant

each switch in the yard so that direct communication can be obtained between the motorman and the tower operator for the rapid movement and dispatching of trains.

TELEPHONE AND FIRE ALARM SYSTEMS

Two telephone systems are installed in the subway, one for general purposes and another for operating the road. The general system consists of a 50-pair and a 110-pair telephone cable extending the length of the subway and terminating in a machine switching board at the administration building. The telephones in the cashier's booths at the stations, those in the shops and some of the telephones located on station platforms are connected to the general system.

The operating system consists of a 50-pair cable running the full length of the subway and terminating at a manually operated switchboard in the administration building. These telephones are located on station platforms, in interlocking towers, emergency exits, shop offices and in the dispatcher's office at the administration building. This system is used by the dispatchers for conveying the necessary information for operating the road.

The fire alarm cable forms a loop extending the full length of the subway and is tapped at all station areas. At each station there is a master box which is operated from any one of several auxiliary boxes in that area. Operation of the master box sounds the alarm by direct connection to the electrical bureau in City Hall. At the same time this information is relayed from the electrical bureau back to the administration building by another line in the fire alarm cable. In addition to these lines the fire alarm cable contains a direct line from the dispatcher's office in the administration building to the electrical bureau. Fire alarm boxes are installed at all emergency exits as well as at the stations.

Advertising Public Transportation

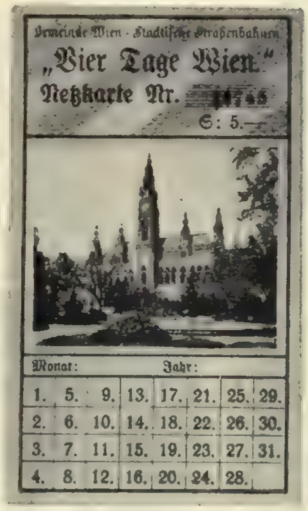
MANY electric railways in Massachusetts for some time past have been carrying on persistent campaigns looking toward increased patronage. The Worcester Consolidated Street Railway has completed an unusually successful year of advertising in the newspapers in its territory. Moreover, its publicity department provided news and the papers responded with editorials which, whether commendatory or not, attracted the attention of the public to riding—swiftly, cheaply and safely. The Eastern Massachusetts Street Railway has been running advertisements that are attractive, catchy and substantial. One of these reads: "This is the man from our town who is so wondrous wise; he rides electric cars to and from business. Thus—to work on time;—home on time; no hot words from the boss; no cold meals from the wife; a carefree, happy, thrifty life is his."

One company, the Massachusetts Northeastern Street Railway, specializes in advertisements mainly for its amusement park at Canobie Lake, N. H. The Fitchburg & Leominster Street Railway, which emerged from its second year of reorganization under its own resources on Jan. 1, has taken up the advertising program and has just finished its first year. Any change in running time or routes of electric cars is advertised before, during and after the change. The company sends its messages through the vicinity papers, through its Whalom Park Theater, through the amusement park at Whalom, and by means of other good-will advertising.

Many of the companies have made effective use of the advertising suggestions furnished to them by the American Electric Railway Association.

◆

Transferable Pass in Vienna



Gemeinde Wien · Städtische Straßenbahnen

„Vier Tage Wien."

Netzkarte Nr. [illegible]

S: 5.—

Monat:				Jahr:			
1.	5.	9.	13.	17.	21.	25.	29.
2.	6.	10.	14.	18.	22.	26.	30.
3.	7.	11.	15.	19.	23.	27.	31.
4.	8.	12.	16.	20.	24.	28.	

Vienna four-day system pass developed for tourists

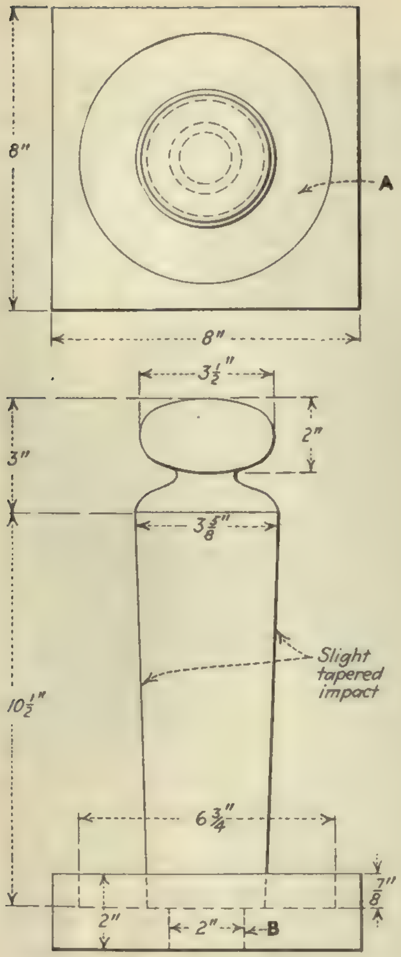
LIKE other European systems, the Vienna Municipal Tramways has a wide variety of fares, including passes. Hitherto these passes have been issued only with the picture of the purchaser and have been non-transferable. Last year, however, the management added a four-day, transferable pass which proved of particular value to visitors to the Schubert centenary. It proved so popular with the visitors that about 28,000 were sold during July, while ordinary sales run in hundreds each month.

The pass is good for four days and was sold at the low cost of 5 schillings (70 cents). This is the equivalent of eighteen standard fares (28 groschen or 3.92 cents). Buyers average about 30 trips per pass. This includes rides that would be considered "transfers" under American flat-fare systems. While Vienna is largely on a flat-fare basis, the management uses fare receipts which also serve as transfers.

With wider publicity, the four-day pass may prove popular with tourists because it insures them against the cost of mistakes in taking the wrong car.

Maintenance Help

That Have Prove



Babbitting mold with self-aligning feature

Self-Aligning Armature Bearing Babbitt Mold

PRODUCTION has been increased and costs reduced in the shops of the Staten Island Rapid Transit Railway, Staten Island, N. Y., by the use of the self-aligning armature bearing babbitt mold shown in the accompanying illustration. The mold consists of a steel base 8 in. square and 2 in. thick. It is counterbored ⅞ in. deep and of such a diameter as to fit the bearing flange exactly. A hole is bored through the center of this counterbore of a diameter to permit the entrance of the core projection.

The core is made of steel and is 14⅝ in. over all. The 1⅛-in. projection is of a diameter to enter the hole in the base. The core has a diameter of 3⅝ in., 3 in. from the top. The sides are machined with a small taper for a distance of 10½ in. This taper permits easy removal from the bearing after the babbitt has been poured. The top has a semi-ball handle with a diameter of 3½ in. and is 2 in. high. The close fits prevent any lateral motion of the bearing or core. The bearing is placed in the mold with the flange in the counterbore of the base; then the core is placed inside with its projection in the bore. A galvanized iron plate designed to fit the bearing window accurately is equipped with two semicircular springs for snapping over the bearing. With the window closed, no further work is required and the bearing is ready for the babbitt.

◆

Adjustable Armature Winding Stand*

By R. T. Chiles

Master Mechanic Cumberland County Power & Light Company, Portland, Me.

RAILWAYS that have armatures of different sizes find an adjustable winding stand to be a great convenience. Such a stand has been constructed in the shop of the Cumberland County Power & Light Company to accommodate armatures from the smallest air compressor type to the largest railway motor type used on the system. Two supporting brackets are fastened to a small work bench in such a manner that they can be moved back and forth quickly. The stand is equipped with casters so that it can be moved easily to any desired position in the winding room. Armatures are carried on their centers, with cone-pointed screws, which work through the end supports.

Axle Tongs Solve Lifting Problem*

By Charles Herms

General Foreman San Diego Electric Railway, San Diego, Cal.

VARIOUS methods for lifting axles have been tried in the shops of the San Diego Electric Railway. Chains, hooks and rope slings were found unsatisfactory, inefficient and dangerous. The chain had a tendency to slip if the work was not balanced accurately, and required additional time of workmen to make certain that the work was balanced. Hooks had the same tendencies as the chains with the additional danger of losing the work altogether in case of a slip. Rope slings also required balancing of the work and had to be renewed at frequent intervals to safeguard them against breakage.

The problem has been solved quite effectively through the use of a special type of tongs. These are constructed so that they receive the largest diameter axle used, although on this system axles are of quite uniform diameter. The jaws are made long enough, so that should the axle be slightly less in diameter than the

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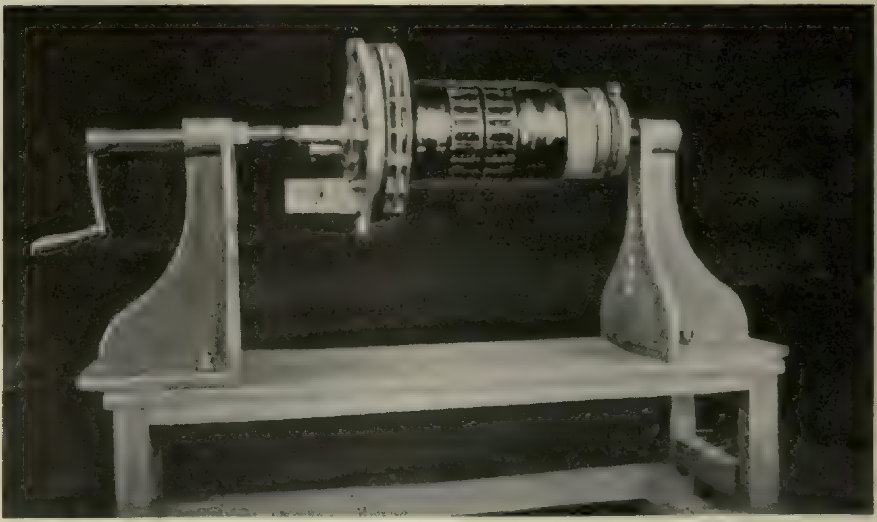
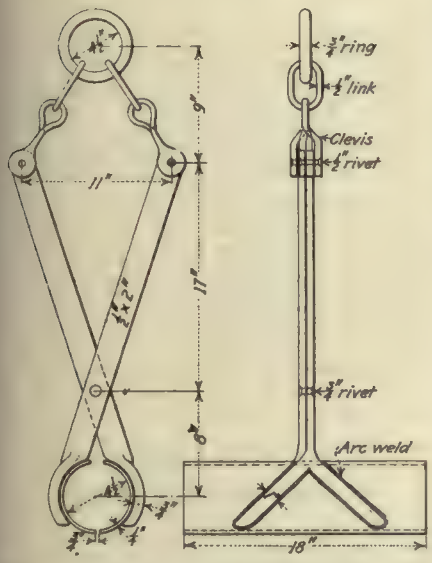
**Submitted in* ELECTRIC RAILWAY JOURNAL *Prize Contest.*



Armature winding stand as used in the shops of the Cumberland County Power & Light Company maximum for which the tongs have been designed, it will remain balanced, due to the length of the jaws and the side clamping effect. Clearance of ¾ in. is provided at the bottom of the jaws, so that the tongs can be placed several inches out of balance and still maintain equilibrium, and there is no possibility of slippage, due to the enormous leverage ratio provided.

aluable



Type of axle tongs used in the shops of the San Diego Electric Railway

Each arm of the tongs has a swivel clevis at the top and these are connected to a ring through links. The circular portion which surrounds the axle is 18 in. long.

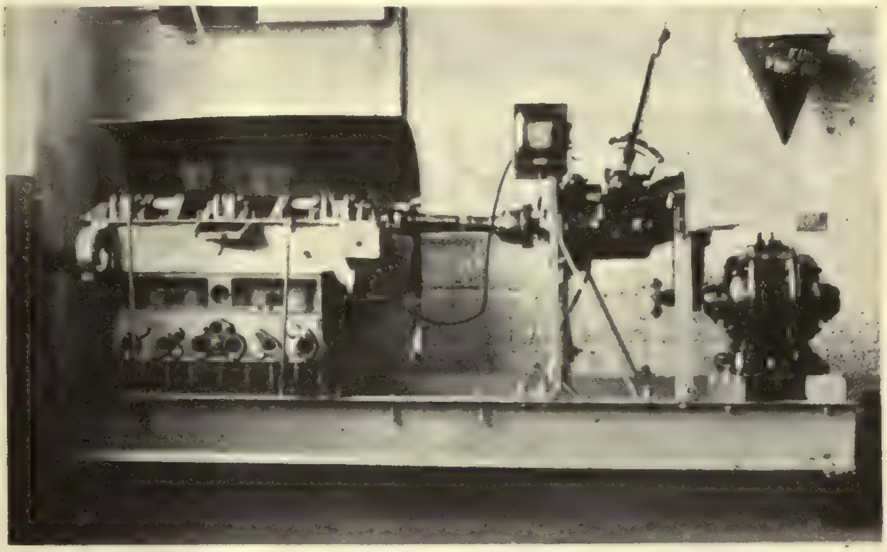
◆

Limbering Up Bus Engines*

By C. B. Hall

Chief Clerk Mechanical Department
Virginia Electric & Power Company,
Norfolk, Va.

FOR burnishing and limbering up main and connecting rod bearings in assembled bus motors and air compressors, following general overhauling work of those units in the bus shops, the Virginia Electric & Power Company, Norfolk, Va., has built a convenient machine. A four-speed transmission was taken from a retired model 15 White bus and geared to a 5-hp. 220-volt alternating-current motor, which had previously been used in operating a ticket cutting machine in the cashier's office. These units, with a gear ratio of 7 to 1, were mounted and bolted to a frame made of 8-in. channel iron and 1x2-in. iron straps. An I-beam was cut to serve as blocks necessary to give the variation in height for accommodating different types of motor blocks.



Tuning up a model 53 White bus motor with the burnishing machine made in the shop of the Virginia Electric & Power Company

A starter box was placed on top of the frame and a piece of No. 20 gage sheet iron was made into a hood to protect the shop walls and windows from flying oil and grease when the machine was in operation. The labor cost for the completed machine was $25. It has enabled the bus shop to do this kind of maintenance work in a most satisfactory manner.

◆

Air Compressor Bearings Reamed

AIR compressor bearings formerly were fitted by the scraping and filing method in the shop of the Richmond Railways, Staten Island, N. Y., until it was found that compressor maintenance expense was increasing because the bearings were fitted improperly. Often shaft distortion also caused considerable trouble. This resulted in serious road delays. A complete set of Pratt & Whitney reamers was purchased for reaming all bearings and wristpin bushings to a standard size in order to overcome this trouble.

The crankshaft bearings are now reamed to the exact size and are not provided with any adjustment. The connecting rod bearings are provided with seven 0.017-in. shims on either side and reamed to fit the shaft under those conditions. The general appearance of the reamers is shown in the accompanying illustration. The reamers are stored under lock and key in a special cabinet 24 in. wide, 41 in. high and 6 in. deep.

Since this method of fitting bearings has been adopted the usual bearing troubles have been eliminated. This has resulted in lowered maintenance costs, and the saving effected in fitting the bearings very soon paid for the cost of reamers.

Wooden cabinet for storing reamers in shop of Richmond Railways

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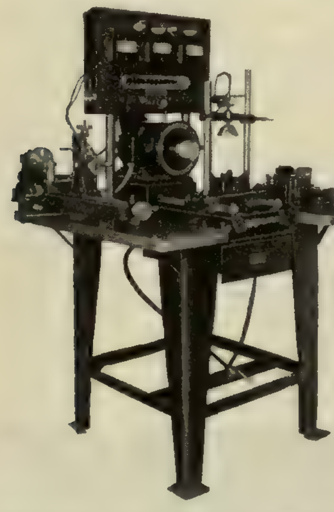
*Submitted in Electric Railway Journal Prize Contest.

New Equipment for Better Maintenance

Test Bench for Bus Equipment

EQUIPPED for testing all electrical apparatus of buses, a heavy-duty test bench is now being manufactured by the Burton & Rogers Manufacturing Company, Boston, Mass. This bench has a 3½-hp. variable speed main driving motor, an adjustable vise for holding all types of bus generators, a rotary spark gap, a magneto testing fixture, a growler, a voltage regulator testing bracket, a tool for turning and undercutting commutators, a coil testing bracket, attachment for making starter torque tests, a control panel and an instrument panel on which are mounted a voltmeter, ammeter, and electrical tachometer, switches and an adjustable spark gap.


Heavy-duty test bench for bus electrical equipment

The main driving motor is of the reversible brush shifting type and has a speed range of from 100 to 4,000 r.p.m. It has sufficient power for a complete driving test over all speed ranges for any type of bus generator up to 1,000 watts. The generator under test is held in the vise directly in line with the driving motor and attachments are provided for the straight line drive of any type.

The voltage regulator bracket will mount all types of regulators. It is so constructed that the voltage regulator can be held in a horizontal position when it is necessary to make adjustments and turned quickly to the vertical position for testing without disconnecting any leads. The vise for holding magnetos is provided with speed adjusting pulleys and twelve built-in, high tension leads. The magnetos under test can be driven at any desired speed down to 20 r.p.m.

A coil testing bracket is furnished, equipped with an attachment for testing magneto armatures. A set of breaker points is built in for duplicating car operating conditions when making coil tests. A condenser is also built in this same circuit and can be used or not at the option of the operator according to the style of coil to be tested. Separate condenser tests are provided for by substitution of outside condensers for the panel condenser. A resistance is also furnished in the coil circuit to control battery voltage while coils are being tested.

Leads for all tests except the high tension leads are terminated in the terminal panel which is constructed in the front of the bench just under the holding vise. By this construction, possibility of leads being tangled up in moving parts is eliminated, and simplicity and convenience of operation is obtained.. On the terminal panel there are positive and negative starter test leads through an 800-amp. shunt to the ammeter; positive and negative battery leads through a 40-amp. shunt to ammeter; positive and negative voltmeter leads direct to the voltmeter; positive and negative 80-amp. leads through an adjustable rheostat to ammeter; switch controlling battery current and switch for cutting in or out the condenser. The starter and carbon resistance leads are of screw type, while on the others lighter "rajah" connectors are used. On this terminal or control panel are also located the control knobs for coil and generator rheostats and the control for adjusting the speed of the driving motor.

A 9-in. rotary spark gap is furnished for making operating tests on distributors. This gap has an adjustable setting for its zero. It is also equipped with an additional scale over one quarter the circumference that reads twice the distributor degrees. The bench is also equipped with a distributor holding attachment.

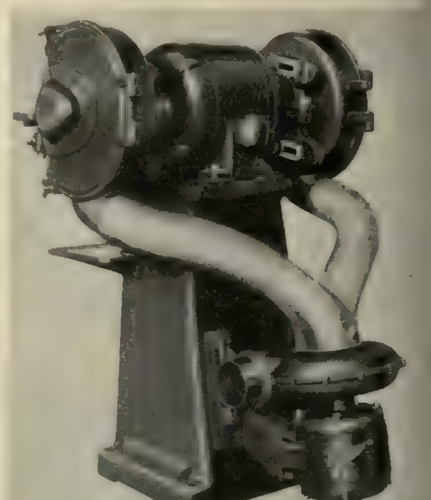
The armature reconditioning tool driven from the main driving motor will handle all types of armatures and can be used for turning down the commutator and undercutting the mica. A scroll chuck and steadyrest are supplied for handling centerless armatures. A torque arm and spring balance are used for testing starting motors, the current for this operation being supplied from the battery.

The growler has a double winding, is equipped with test prods, a meter for recording the flow of current in the windings of the armature and a double pole, double throw switch. The double winding makes it possible to test starting motor armatures as well as generator armatures.

◆

Exhauster for Grinders, Buffers and Polishing

TO PROVIDE for efficient removal of dust from grinding, buffing and polishing operations, the Hisey-Wolf Machine Company, Cincinnati, Ohio, has announced an exhauster equipment which can be supplied for this company's machines. It is designed for grinders of 10-in., 12-in. and 14-in. wheel capacity and for buffing and polishing machines of 8-in., 10-in., 12-in. and 14-in. wheel capacity. The exhauster equipment is motor driven and the same automatic starter that provides for operating the tool controls the exhauster motor.


Grinder equipped with exhaust attachment

News of the Industry

Fare Discussed in Milwaukee

Company would like to see rate structure adopted that would give promise of making railway self sustaining

AS THE result of a request made by Mayor Hoan, of Milwaukee. Wis., that the Milwaukee Electric Railway & Light Company extend its single-fare area to apply on all railway travel within the city limits, particularly the former city of North Milwaukee, recently annexed, a hearing was held before the Wisconsin Railroad Commission on Feb. 25 at which the company asked the commission to fix boundaries of a single-fare area, and fix rates which would put the city and suburban transportation system on a self-supporting basis.

The company stated that the investment in the railway has increased from $16,694,409 in 1920 to $28,263,980 in 1928. The deficit below the amount necessary for 7½ per cent return on the investment was stated to be $529,369 in 1920, $552,651 in 1921, $343,838 in 1922, $295,865 in 1923, $521,908 in 1924, $536,340 in 1925, $585,666 in 1926, $835,817 in 1927 and $691,089 in 1928.

Actual rate of return on the railway through the same period, the petition stated, ranged from 4.32 per cent in 1920 and 1927, the two lowest years, to 6.09 per cent in 1923, the highest year. In 1928 the rate of return was 5.05 per cent.

The deficit has been made up from electric department revenues. The company promises that, if standards of service and rates of fare to be prescribed are calculated to yield an increased return upon its railway and bus service, it will reduce electric rates by an amount not less than the estimated increase in railway revenues.

William A. Jackson, vice-president of the company, testified that under present rates regular riders are discriminated against, that the occasional rider should pay an increased fare, and that regular riders should pay the minimum rate possible. Statistics were submitted showing that, due to inclement weather in January of this year, from 50,000 to 70,000 more casual riders were carried on certain days than in the similar month last year.

The company holds the zone system of fares to be the most fair and equitable. If the demand for an extension of the single-fare limits to include former North Milwaukee was granted, this would eliminate the zone fares on that line, approximately $30,000 a year.

R. E. Moody, research engineer of the company, said that Detroit is one of the very few large cities having a lower cash fare than Milwaukee, its rate being 6 cents without a transfer, 7 cents with transfer. Milwaukee has a 7-cent cash fare with transfer, and eight tokens for 50 cents.

All suburbs, towns and townships surrounding Milwaukee and served by the company were represented at the hearing, which was adjourned to permit the legal representatives of the city and suburbs to study the figures presented. At the request of the commission, the company will present its recommendation for a method of putting into effect an increase of fares so designed and arranged that it will fall principally upon the occasional rider.

◆

Bus Considered by Steam Railroads

Motor transport divisions to meet again in fall at call of general committee. Logical demand seen for bus and motor truck auxiliaries

MORE than 100 representatives from 80 railroads attended a four-day conference of the motor transport division of the American Railway Association at the Hotel Jefferson, St. Louis, Mo., February 26, 27, 28 and March 1. Until the final day the sessions were all executive, and the reporters for the daily and trade press were excluded with the exception of a special writer for one railway publication.

The gathering on March 1 was in the nature of a joint conference for all interested in automotive transportation. Its purpose was to discuss matters of mutual interest.

The program for this joint conference was as follows:

1. Depreciation of motor coach equipment.
2. Heavy fuels versus gasoline as fuel.
3. Rail cars versus motor coaches on feeder lines.
4. American Electric Railway Association classification of motor coach accounts.
5. Uniform cost-accounting for the railroad company; for the electric railway; and for the motor coach operator.
6. Method of classifying operations—for example, city, intercity and the like—so that cost comparisons will be useful in each class.
7. Rates of fare necessary for profitable operation.
8. How the motor truck and the motor coach help to meet competition.
9. The motor truck in modern business.
10. Highways to reach distant markets.

A. P. Russell, chairman of the motor transport division, presided at the executive sessions and he also read the report of the general committee of which he was the chairman.

The consensus of the railroad men attending the conference was that the American railroads are the logical agency to develop the motor transport field because they are charged with the responsibility of maintaining stability of the nation's transport. Speakers in the executive gatherings contended that this ideal cannot be attained unless the railroads are protected against the independent agencies which are alleged to milk the revenues of the steam railroads.

Some of the discussions in the executive sessions are understood to have been rather frank and it was apparent some of the railroads now realize they probably waited too long to enter the motor transportation field, permitting independent lines to build up close to their rails, so that it will be very difficult to combat this competition. Virtually all of the important railroads of the country were represented. Some have not yet entered the bus field and their representatives came to the gathering to get the inside facts from railroad men who have had experience with bus operations.

While a majority of those who spoke on the subject maintained that rail transportation still is and will continue to be the backbone of our national transportation scheme, they were ready to admit there is a logical demand for buses and motor truck lines and a legitimate field in which they can be operated successfully. That the railroads should supply the public's demand for automotive transportation agencies because of preferential right and considerations of public welfare was discussed.

It was also contended that federal regulation of buses would prove beneficial to the general public as it should weed out the undesirable and irresponsible operators and eliminate the present evasion of state control in many sections of the country.

It was brought out in the discussions that the competing bus lines have eaten heavily into revenues logically belonging to the railroads, in most instances taking the cream of the passenger business. It was contended that the buses can never supplant the railroads but, unless properly controlled, may injure the national transportation system by forcing some railroads into bankruptcy. The only way to solve this very serious problem is to direct bus development along proper lines with the consideration in mind of not impairing railroad prosperity. The Interstate Commerce Commission with its voluminous records and its vast knowledge of transportation needs would be an ideal agency to handle the entire bus situation, it was said. Chairman Russell is quoted:

> One reason that railroads more logically and more serviceably can develop the bus field is that sometimes they can combine bus and rail transportation in such a way as to turn a loss in rail transportation into a profit in bus operation, while independent bus operators could not do so. Another very important reason is that reliability of service is the first consideration of the railroads.

A surprising fact brought out in the discussions of the subject was that the bus lines of the country now cover more aggregate mileage than the railroads. The total in 1928 was 270,000 miles covered by 86,000 buses or 13,000 more miles than the railroads now serve. However, it was said the railroad systems are more comprehensive, serving vast areas not penetrated by the bus lines. The bus lines are generally confined to the relatively congested metropolitan areas, not attempting a comprehensive national system except in a few isolated instances.

The general purpose of the conference was to bring together the railroads interested in the development of bus transportation, to study the problems that arise therefrom, and through the co-ordination of rail carriers to devise the most effective means possible in the development of combined rail and bus transportation systems.

The next meeting of the motor transport division will be held in November of this year at Toronto, if the general committee's recommendation is accepted. The by-laws of the organization were amended to provide for but two meetings annually instead of three. June and November were the months selected for these meetings, but there will be no session this June because of the sessions held in St. Louis.

A special nomination committee of seven was named to recommend candidates for the various offices. The election will be held in November. This nominating committee is composed of: M. F. Steinberger, manager of highway transportation Baltimore & Ohio Railroad; L. B. Burns, assistant to the general manager Seaboard Air Line Railway; E. Wanamaker, electrical engineer Chicago, Rock Island & Pacific Railway; G. L. Whipple, general superintendent transportation Union Pacific System; George McCormick, general superintendent motive power Southern Pacific Company; F. S. Hobbs, general manager New England Transportation Company; and E. A. Cunningham, efficiency engineer Canadian Pacific Railway.

The delegates were guests at a banquet given by the Missouri Pacific Lines at the Hotel Jefferson at 6:30 p.m. on Feb. 27. Samuel O. Dunn, Editor of *Railway Age*, Chicago, was the speaker of the evening. His subject was "Modern Transportation." On the morning of Feb. 27, E. F. Bisbee, vice-president East St. Louis Junction Railroad, was host at breakfast at the National Hotel, National Stock Yards, Ill.

Franchise Proposal Revived in Jacksonville

Definite announcement was made before the Council of Jacksonville, Fla., on Feb. 22 that a new franchise for the Jacksonville Traction Company would be submitted at an early meeting of the City Council. At the suggestion of Perry Atkins, president, the Council adopted a resolution requesting Mayor John T. Alsop, Jr., to veto the ordinance requiring the company to double-track Main Street, thereby opening the way for bus service.

Mr. Atkins made his promise that the new franchise would be submitted to the Council after J. P. Ingle, railway manager, made his proposal for the establishment of bus service to Norwood, Brentwood, Panama Park, Northshore Beach and Panama Gardens sections.

Mr. Ingle quoted figures gathered in a poll of the sections on the north side of the city on the question of preference for bus service. He said 70 per cent of the residents interviewed on Main Street favored buses, 72 per cent off Main Street in the section served by the Brentwood car line favored buses, and 95 per cent in Norwood, Panama Park and Northshore Beach desired bus service.

Mr. Atkins intimated the new franchise would leave the City Council as the body to determine the need for extentions and to say whenever and where such extensions would be needed. The company would be relieved of paving the strip occupied by tracks and extensions would be paid for from rentals to the company. He said he believed the Council would grant bus permits to the company under an agreement which would provide for adequate and continuous service.

A resolution by residents in the territory that would be affected by the extension of the railway and believed to represent public opinion in the territory was concluded as follows.

> We, the citizens of North Springfield, Norwood, Panama Gardens, Panama Park, Brentwood, Pearl Court and North Shore Beach do hereby ask Mayor John T. Alsop, Jr., to veto City Council's ordinance ordering the Jacksonville Traction Company to double-track Main Street and do hereby petition City Council to reconsider its ordinance in respect to the wishes of the majority of the voters in these communities who want bus service instead of street car service, and we further ask that the City Council do authorize the Jacksonville Traction Company to remove its tracks on Main Street north of Twelfth Street, and also relieve the Jacksonville Traction Company from payment of Main Street paving charges north of Twelfth Street to enable the Jacksonville Traction Company to provide the bus service these communities want.

Paving Relief Bill Reported in Pennsylvania

The Senate committee on public roads and highways on March 5 vetoed by a scant majority to report the bill relieving electric railways in Pennsylvania from repaving the portions of streets and highways between their tracks which are torn up by municipalities. A contest among the members developed over the measure, it was understood. The vote was 14 to 11.

Free Rides to "Economy" Sale in Atlanta

Monday, March 4, was the date of the opening of the Spring Economy Sale at W. T. Grant Company's store, on Whitehall Street, in Atlanta, Ga., and the store gave away free, two car tickets to all persons who purchased as much as a dollar's worth of merchandise in any one department of the store. The following suggestion was made to passengers on the transportation lines of the Georgia Power Company:

> When you pay your fare on your way to town in the morning just request the conductor or operator to give you a coupon, and when you have finished your shopping at Grant's the management of the store will give you two street car tickets, the cost of your transportation to the store and back home.

This is the second time Grant's has offered the free car ticket plan. Last October, under similar circumstances, several thousand Atlantians took advantage of the similar offer to add to the saving in bargains offered at the store.

Delay Asked in Wheeling Fare Case

A delay of 60 days in the rate hearing of the Wheeling Traction Company, which was scheduled for Feb. 28 at Charleston, was asked by representatives of the Wheeling Chamber of Commerce, the Merchants' Co-operative Association and the City Council following a joint meeting. The motion for the extension was made by a representative of the Merchants' Association.

Ambulance-Chasing Forbidden in New York

New rules to regulate the conduct of lawyers, especially in negligence cases, and designed to end "ambulance-chasing" or soliciting of retainers for any other branch of litigation were announced on Feb. 26 by the Appellate Division of the Supreme Court, First Department. The rules apply only to the attorneys in New York and Bronx Counties.

The new code, which also deals with the terms and with the settlement of litigation, is the response of Presiding Justice Dowling and Associate Justices Merrell, Finch, McAvoy, Martin, O'Malley and Proskauer to the recommendations made by Supreme Court Justice Wasservogel in his report last October on his investigation for the Appellate Division.

The new rules prescribe many of the requirements which Justice Wasservogel recommended as necessary to stop ambulance-chasing, the only important features of the Wasservogel report omitted from the rules being those regarded as requiring legislative action. Bills have already been introduced to effect these reforms.

The recommendations of Justice Wasservogel's report not included in the new rules because of the necessity of amending existing laws relate to declaring 33 1-3 per cent a maximum share of any recovery to be paid to an attorney for his services when a contingent retainer is made with a client, and also deal with an extension of the power of the courts to punish perjury and criminal contempt.

Justice Wasservogel recommended the addition to a judiciary law of a clause describing the power of the court to punish for a criminal contempt the following: "Willful disobedience to its lawful mandate: or the doing willfully and knowingly of an act without the mandate or authority of the court, where a statute requires such mandate or authority to be procured before such act may be done."

The corrective legislation has since been lost in committee.

"As-U-Go" Name of New Denver Publication

Mrs. C. E. Marks, 1660 Logan Street, Denver, won the $25 reward of the Denver Tramway Corporation for suggesting "As-U-Go" as the name for the new 4-page bulletin published by the company "that those who ride may read." More than 20,000 suggestions were received and considered, but Mrs. Marks was the only contributor who suggested this name.

In a statement the company said:

> Now that it's all over, and the bulletin is named, what do you think of it? From now on, we hope to make this little paper increasingly interesting. In this connection, we beg to call your attention to page 2, where you will find a time-plan of morning week-day inbound car service for Route 11. Time-plans of this kind for various routes will be published from time to time. Is information of this kind interesting to street car riders? We hope it will prove a service convenience and will be the means of expediting street car service. So read As-U-Go. Read as you ride, or take As-U-Go with you when you leave the car.

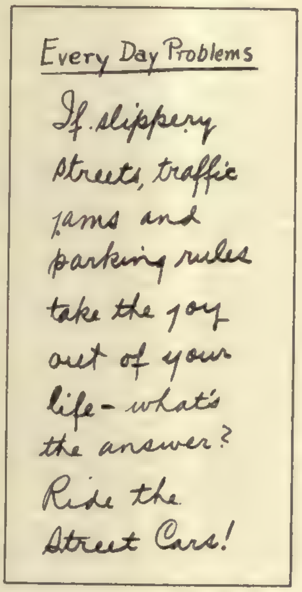
Safety Tunnels for Seattle

George B. Avery, superintendent of utilities at Seattle, Wash., in charge of the street railways, is backing a move to obtain from the City Council an appropriation for underground crossings for pedestrians at the intersections of Pike Street with First, Second and Third Avenues. The project would cost approximately $50,000 and is entirely separate from the proposed plan to construct seventeen new safety tunnels at Seattle schools, which would also cost $50,000.

Tacoma Mayor Resigns After Dispute

Mayor Melvin G. Tennent, of Tacoma, Wash., following a dispute with the corporation counsel's office, has resigned his position, and Ira S. Davisson, commissioner of light and water, has become temporary Mayor. Mayor Tennent is the principal owner of the Tennent Steel & Casting Company. He has been extremely active in an effort to adjust the transportation problems in Tacoma, co-operating with the Tacoma Railway & Power Company.

Appealing for Patronage in Salt Lake



Every Day Problems

If slippery streets, traffic jams and parking rules take the joy out of your life—what's the answer? Ride the Street Cars!

One of a series run by the Utah Power & Light Company during January which won favorable comment. Two ads were run each week—on Tuesdays and Fridays in the three Salt Lake City papers, *The Tribune*, *Deseret News* and *The Telegram*.

Would Speed Up Kansas City Cars

Plans are being made by the Kansas City Public Service Company, Kansas City, Mo., to speed up service, in the belief that to cut off several minutes on the average trip from the residential sections to the downtown district will attract additional patronage. Although they are not ready to put their plan before the City Council, officers of the company propose to use three methods:

> A skip-stop plan to reduce the number of stops to something like a stop for every two long blocks and for every three short blocks.
>
> All principal street car streets to be arterial thoroughfares.
>
> Street cars to have right-of-way and a clear path on their own tracks.

According to Powell C. Groner, the company will be ready to present its plan to the Council after two more weeks of study. Either a trial on three or four important lines, or an offer of a complete skip-stop and arterial plan for the entire city may be made. A tentative study shows how the number of stops can be reduced from 124 to 82 in one case on the round trip, and from 159 to 105 in another.

Work on Milwaukee Rapid Transit Line Being Pushed

Work began on Dec. 3 on the rapid transit line of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., is being continued with vigor. By means of a subway terminal now contemplated and 2.8 miles of new line on private right-of-way, this project will provide high speed local service between Milwaukee and the rapidly growing urban district to the west.

To the south, work is well under way on the relocation of 6 miles of track of the Milwaukee-Racine-Kenosha Rapid Transit line to provide faster schedules and greater freedom from traffic interference. This job is scheduled for completion late this summer.

Grade separation is planned for 2½ miles of double track of the Milwaukee Northern division Rapid Transit line immediately north of the city. A program of necessary reconstruction of tracks will also be undertaken.

Committee on Movement of the Vehicle Meets in Chicago

With four subcommittees meeting on Feb. 23 and the main committee session occupying all of March 1, two crowded days of intensive consideration were devoted to ways and means of expediting the travel of all types of vehicles through city streets.

Both sessions were indebted to the Chicago Surface Lines for the privilege of including E. J. McIlraith and two of his traffic engineers in the discussions.

Subcommittee reports were presented by C. H. Evenson, E. D. Merrill, Joe R. Ong, and R. H. Pinkley on specific phases of the vehicular movement problem, as outlined in the ELECTRIC RAILWAY JOURNAL for Dec. 22, page 1091.

The main committee with Paul E. Wilson as sponsor and D. L. Fennell, chairman, will hold its final meeting in New York on April 26.

Opposition Develops on Highway Use

Democratic assembly district leaders are on record as opposed to the taking over by the county of the Erie County Traction Company's line from Buffalo, N. Y., to Hamburg and other nearby towns for the purpose of making a 40-ft. main traffic highway out of the Abbott Road and several other highways along the route of the railway. A bill to permit the county to acquire the railway's right-of-way has been prepared for introduction into the Legislature.

Higher Fares in Columbus Postponed

The city of Columbus, Ohio, has succeeded in securing a postponement until April 1 of the plan of the Columbus Railway, Power & Light Company to increase cash fares from 6 cents to 10 cents, and from 25 cents to 35 cents for five tickets.

Councilman Fred Zimpfer, chairman Council utilities committee, has proposed that a utility engineer be appointed to assist the city in adjusting the fare controversy. He wants to start franchise negotiations with the company immediately after April 1.

The company is now operating without a franchise.

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Election of Commissioners in Maryland Voted Down

Efforts to have the members of the Maryland Public Service Commission elected by the people rather than appointed by the Governor have failed. A bill providing for the change was introduced in the General Assembly, now in session at Annapolis, but has been defeated.

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Drivers' Creed in Grand Rapids

The Commercial Drivers' Club, Grand Rapids, Mich., organized several years ago to promote safety, assist in reducing traffic congestion and assist the Grand Rapids Railroad in maintaining unobstructed right-of-way, has again established a precedent by adopting an official drivers' creed. In the cab of every member a printed creed card is hung so that the safety message is in sight at all times. The text of the creed:

> As a member of the Grand Rapids Commercial Drivers' Club I pledge allegiance to the following safety creed:
>
> To keep the vehicle I drive in proper mechanical condition at all times.
>
> To inspect carefully and keep under careful supervision my load, insuring safety from falling articles.
>
> To keep my machine under perfect control.
>
> To keep off the Grand Rapids Railroad Company right-of-way as far as possible, avoiding interference with operation of its cars.
>
> To obey all traffic regulations and drive in accordance with street signal light dictation; to use special care when driving in school zones.
>
> To keep constant vigil for children wherever I am driving.
>
> To be courteous to all officers of the law and to do my part in case of unavoidable accidents.
>
> To all this I gladly subscribe, in an effort to make Grand Rapids a safer and better place to live.

Since the Grand Rapids club was organized, which organization was mentioned in the ELECTRIC RAILWAY JOURNAL, President Harry Bowles has sent copies of the by-laws to many cities organizing similar clubs designed to put into effect the accident reduction features of the Grand Rapids Code.

COMING MEETINGS OF *Electric Railway and Allied Associations*

***March 12-14*—Oklahoma Utilities Association, annual meeting, Oklahoma City, Okla.**

***March 14-15*—Illinois Electric Railway Association, Hotel Abraham Lincoln, Springfield, Ill.**

***March 20*—Central Electric Traffic Association, Keenan Hotel, Fort Wayne, Ind.**

***March 21*—New England Street Railway Club, Annual Meeting, Boston, Mass.**

***April 5*—Metropolitan Section, American Electric Railway Association, 33 W. 39th Street, New York, N. Y.**

***May 1-3*—Indiana Public Utilities Association, Indiana Gas Association and Indiana Electric Light Association, annual joint convention, Hotel Gary, Gary, Ind.**

***May 13-15*—National Highway Traffic Association, annual meeting, Stevens Hotel, Chicago, Ill.**

***May 15*—Association of Electric Railway Equipment Men, Middle Atlantic States, semi-annual meeting, Wilmington, Del.**

***June 5-7*—Canadian Electric Railway Association, annual convention, Montreal, Quebec.**

***June 21-22*—New York Electric Railway Association, Bluff Point, N. Y.**

***June 27-28*—Central Electric Railway Association, Michigan City, Ind.**

***July 24-26*—Electric Railway Association of Equipment Men, Southern Properties, Lexington, Ky.**

***Aug. 15-16*—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.**

***Sept. 28-Oct. 4*—American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium, Atlantic City, N. J.**

Employee Education Subject of Detailed Study

At its second meeting, held in Chicago on March 4, the committee on the employee, of the Transportation and Traffic Association, continued its consideration of outstanding problems of railway personnel from the transportation standpoint. Subcommittees, under Chairman H. H. Fenton, Chairman C. S. Slocombe, and Chairman W. Frank Persons, dealing respectively with employee information, accident-proneness and selection and follow-up, reported progress on the specific phases of the study assigned them.

Excursion Rates Popular on Kentucky Line

Week-end excursions to points in the tri-state territory by electric railways are increasing travel greatly, according to G. M. Millican, general manager Evansville & Ohio Valley Railway, Evansville, Ind., operating a railway line to Grandview, Ind., and bus lines to Mt. Vernon, Ind., and Henderson, Ky. By special tariff for the week-ends, passengers are afforded transportation at reduced rates. Tickets purchased at Evansville on Saturday or Sunday for any points along the railway and bus lines are good until Sunday night. The Rockport line between Evansville and Owensboro, Ky., in particular, is carrying heavy passenger lists at the week-ends.

According to excursion schedule of prices, the round-trip fare to Owensboro, Ky., is $1.50; Troy, Ind., $2; Tell City, $2.25; Cannelton, $2.25. These figures represent reductions of from 75 cents to $1 on each trip. Saturday-Sunday rates to Newburgh are 40 cents and to Mt. Vernon by the company's bus line, 85 cents.

The heavy haulage of coal by this company's lines this winter has greatly increased the freight end of the business.

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Rolling Stock Committee Program for Cincinnati Meeting

Arrangements for the meeting of the standing and special committee of the rolling stock section, American Electric Railway Association, which is to be held at the Gibson Hotel, Cincinnati, Ohio, on March 11-12, are being completed, according to E. J. Jonas, superintendent of equipment Cincinnati Street Railway, local chairman of the committee. The program at present is:

MONDAY, MARCH 11, 1929

9:30 A.M. Meeting of standing committee of rolling stock division.
Meeting of each special committee.
12:00 Noon. Adjourn for lunch. All to lunch together in some convenient room.
1:00 P.M. Resume committee meetings. It is expected by this time one or more of the special committees will have finished its report and wish to discuss it before the standing committee.
6:00 P.M. Adjourn.
7:30 P.M. Informal dinner or banquet with a special speaker to be announced later.

TUESDAY, MARCH 12, 1929

9:30 A.M. Meeting of standing committee with special committees.
It is expected by this time that the committee work will have been completed so that special discussion of operating matters such as "pull-ins," etc., can be fully discussed.
12:00 Noon. Adjourn for lunch. All to lunch together in some convenient room.
1:00 P.M. Inspection of new shops, Cincinnati Street Railway, Cincinnati Car Company, and other places of interest.

A. F. Clark, Baltimore, chairman standing committee, has sent out 125 invitations and anticipates an attendance of 75 or more.

Mayor Opposed to $50,000,000 Boston "L" Bill

Mayor Nichols, of Boston, appearing recently before the legislative committee on metropolitan affairs, expressed strong opposition to the $50,000,000 elevated rapid transit bill, suggesting that the measure be returned to the special commission which reported it to be redrafted. He said the bill as it stands is at variance with the special commissioner's report.

The Mayor opposed any plan for actual public ownership of the Boston Elevated Railway system, declaring for extension of public control. At the outset he admitted that he felt it impossible to draft a bill at this time which would receive the approval of the committee and the Legislature. In outlining his objections to the bill before the committee, he said he felt that parts one and two of the bill deprive the districts affected of any control.

Cars Speeded Up by Elimination of Parking in St. Louis

The St. Louis Public Service Company, St. Louis, Mo., reports a saving of eleven minutes a round trip has been effected on its Olive Street divisions through the elimination of downtown parking, the use of the skip-stop plan between Twelfth Boulevard and Channing Avenue, and a general speeding up of the entire system. The operations in January of this year and last year were the basis for the report. In January, 1929, the Olive Street cars traveled 42,661 more miles than in January, 1928.

Riders Receive "Transit News" in St. Louis

"Transit News" has been selected by the St. Louis Public Service Company, St. Louis, Mo., as the name of the miniature newspaper distributed on the street cars for patrons. A prize of $50 was paid to William Voderberg, of 4540 Claxton Avenue, for suggesting the title.

Hearings Soon on $22,000,000 Project for Baltimore

Electrification of the Pennsylvania Railroad lines in Baltimore has struck a serious obstacle. The railroad plans a $22,000,000 improvement project in the city, including tunnels and electrification, but the city is opposed to the railroad's plan to use overhead high-tension wires in Baltimore. The advisory committee appointed by the Mayor, which has been considering a series of ordinances providing for the improvements, has refused to agree to the overhead high-tension feature. The ordinances will be introduced in the City Council on March 11, and after they are referred to the proper committee public hearings will be held to consider the subject.

Recent Bus Developments

Pick-up and Delivery Service Started by Pacific Electric

T. J. Day, freight traffic manager Pacific Electric Railway, Los Angeles, Cal., recently announced the entry of the Pacific Electric Railway into the trucking field in southern California on March 11.

The new company will serve as a feeder to the parent company's rail lines, its trucks maintaining a store-door pick-up and delivery service throughout southern California. In general the truck subsidiary will be an express company and will not, at least for the present, operate trucks on the highways.

As explained by D. W. Pontius, vice-president and general manager of the Pacific Electric Railway, "the motor transport company will perform a complete service from the shipper's store-door to consignee's store-door under a through rate that will cover the entire service."

It will pick up shipments at the shipper's door and haul them to Pacific Electric's rail stations, where they will be transferred to rail cars. Under a contractural arrangement the Pacific Electric Railway will make the line haul to the station of destination, where the load again will be transferred to the Motor Transport Company's trucks for delivery to the consignee's place of business.

The transfer may be effected either by passing the entire truck body intact from the truck chassis to specially equipped rail cars, as in the case of bulk freight, or by the usual method of handling in case of miscellaneous package freight. Such co-ordination creates a greater and more efficient use for both utilities than are in existence or available.

The operation will be conducted by the Pacific Electric Motor Transport Company, a subsidiary, with Los Angeles as the principal place of business and capital stock of 5,000 shares with a par value of $100 a share. Present station agents will act as agents as well for the new company, although entirely separate tariffs and billing documents will govern the subsidiary's operations. Contracts will be made with present truck companies.

Tax Relief Measure in Ohio

A bill introduced in the General Assembly of Ohio by Joseph C. Dinsmore, of Hamilton County, proposes to exempt electric railways which operate buses from paying the excise tax of 1.2 mills on their gross receipts. Under the Ohio law these companies are also required to pay a flat tax each year.

At a committee hearing on the Dinsmore bill, S. L. Lipp, representing the Cincinnati Street Railway, said the existing laws were unfair to companies operating both electric cars and buses, inasmuch as others engaged only in the operation of buses pay only a single flat rate.

C. E. Lewis, Jr., of the New York Central Railroad, representing the steam lines of the state, urged that the committee also consider steam railroads. He said that, while no railroad operating in the state now was engaged in the bus business, he knew of at least two roads which contemplated augmenting their business with buses.

Buses for 13-Mile River Route

A report was made to the City Council of Cincinnati on March 6 by its traffic committee, recommending bus rather than street railway service to Fernbank and other downriver communities on a 13-mile route. Residents of the communities affected presented their views at a hearing held by the committee on Feb. 26, the decision ending a long-standing difference of opinions.

The committee's report contains no reference to fare, although it is known that Murray Seasongood, Mayor, personally favors a 10-cent rate in keeping with stipulations in an annexation agreement with the communities to be served. The fare, however, probably will be 20 cents cash or three tickets for 50 cents, with provision for "Sunday passes," as recommended by E. D. Gilman, utilities director, who pointed out that even with this charge the Cincinnati Street Railway, in operating the buses, would lose about $26,000 yearly.

Advocates of bus service at the hearing included Walter A. Draper, president of the Cincinnati Street Railway.

Railway Co-operates to Stop Cruising Taxis in Providence

Alonzo R. Williams, of the United Electric Railways, Providence, R. I., recently instructed inspectors of his company to co-operate with the police in checking up the activities of cruising taxicabs.

Inspectors have been "spotting" the license numbers of taxicabs whose drivers were soliciting fares. Many of the offenses occurred at street car stops where persons waiting for trolleys decided to avail themselves of taxi transportation. The taxis, he said, travelled repeatedly over an "S" shaped course.

A new city ordinance went into effect Jan. 1 to prohibit cruising cabs in Providence and the police have determined to enforce the measure rigidly. Already drivers have been caught violating the no-cruising rule, which would limit the use of cabs by the public to those called by phone, to those travelling back to their stand from trips, and to those standing at places which are to be designated.

General stands have recently been designated at which cabs may be parked in turn as fares are taken on. Special stands are designated in favor of companies and individual operators of cabs. At general stands all cars other than the hire vehicles are barred from parking. At special stands taxicabs not included in the company permits are prohibited from parking.

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Bus Plea Made in Baltimore

Two applications to operate buses in Baltimore have been filed with the Maryland Public Service Commission. S. W. Mann, president Monumental Motor Tours, Inc., Baltimore, has asked the commission for authority to operate a line of modern 25-passenger buses from Belvedere and Park Heights Avenue to and from the center of the city. The fare, the petitioner states, will be 8 cents with two rides for 15 cents. Eight buses would be operated daily. The schedule would be every five minutes between 8 and 9 a. m. and 5 and 8 p. m. Between 7 a. m. and 11.45 p. m. service would be on the ten-minute basis.

The Conway Motor Company, Westminster, Md., has applied for a permit to establish a service between the Union Bus Terminal, in the downtown section, and Pikesville. The fare would be 10 cents to Park Circle, 15 cents to Arlington and 20 cents to Pikesville.

Harold E. West, chairman Maryland Public Service Commission, has replied to officials of the National Housewives, Inc., who wrote to the commission recently and asked if that body would permit a financially responsible company to operate buses in competition with the system of the United Railways & Electric Company. Mr. West said that installation of such a system would mean the elimination of the present system of railway transportation. The commission would grant permission to the company to operate the buses, he said, only if it could be conclusively proved:

> That the substitution of a system of bus transportation for the present railway would be for the best interests of the public.
>
> That the bus system would give a service as frequent and as comprehensive as the railway system and with a capacity as great as that of the railways, reaching all sections of the city and suburbs, and operating unprofitable as well as profitable lines.
>
> That the rates of fare would be lower than the rates now charged by the railway.
>
> That free transfers from one line to another would be given to the extent that such transfers are now given by the railway.
>
> That the financial resources of the suggested bus company be sufficient to guarantee the permanence of the suggested operation.
>
> That the suggested bus company contribute to the city and state an amount in taxes equal to that paid by the railway, including a sum of more than $1,000,000 annually for the maintenance of the city parks.

Right Sought in Delaware River Territory

Application has been made to the Public Service Commission of Pennsylvania by the Delaware River Coach Company for permission to operate buses between Torresdale and the New Jersey State line in Morrisville, and between the Pennsylvania Railroad station in Croydon and the junction of Pond Street and Wilson Avenue in Bristol. The application covers territory already served by the Trenton, Briston & Philadelphia Street Railway and the Pennsylvania Railroad. The local electric railway system reaches Trenton through an affiliated company, the New Jersey-Pennsylvania Railway, and by connection with the Philadelphia Rapid Transit Company's line at Torresdale passengers are taken into Philadelphia. Thus from Trenton to Philadelphia the electric railway parallels the Pennsylvania Railroad, which lately entered the bus business through acquiring an interest in several bus companies formerly owned by the Philadelphia Rapid Transit Company. It is understood that the new coach company has the backing of the officers of the present trolley line.

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Complaints Aired on Revere Service

Mayor Cassassa, of Revere, Mass., has asked the committee on street railways to authorize the city to operate bus lines. In his assertion that transportation conditions in the city are "desperate," he is supported by a Senator and two Representatives from the city who add that the attitude of the Eastern Massachusetts is "unreasonable," and that complaints made in the past have been futile. On the other hand representatives of the street railway declare that any such legislation as proposed by the Mayor would cause the railway to meet unfair competition. Mayor Cassassa asserts that the Chelsea division of the street railway, which serves Revere, is the most profitable division. He says he is opposed to the principle of municipal ownership but in this case he sees it as the only means of relief.

The Mayor believes the city can operate buses to give Revere residents a 3 or 4-cent fare to Maverick Square, which with the 10-cent fare to Boston on the Elevated would provide rapid transit at reduced rates.

The street railway contends that it is obvious that the purpose of the bill is to ruin the Eastern Massachussetts in that district; that it would be a strange turn of events if the Legislature, which gave public control to the railway, would now proceed to cripple it by granting the request in this bill. P. G. Carleton, of the road, says he realizes the evil of the double fare, but he thinks the action on it may well await the disposal of the report of the special commission with respect to rapid transit. On the whole, transportation conditions in Revere are good. He has suggested to the Mayor that he take his complaints to the company trustees and they will be given attention. Another point made by Mr. Carleton was that the bill meant a reversal of the state's policy regarding municipal ownership, which provides that municipalities must first purchase private companies before entering into public ownership of a similar business.

The matter is still under advisement.

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Adverse Report on Berkshire Bill

The Massachusetts Senate has accepted an adverse report from the street railway committee on the bill to authorize the Berkshire Street Railway to operate buses on the highways of Berkshire County. Had this bill been enacted the company would have been relieved from going to cities and towns for bus permits. This was opposed as vesting too much power in the State House and establishing a precedent as regards the situation in other parts of the state. Concurrence by the House in the action of the upper body was forecast.

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Substitution Proposed in Sedalia

The City Light & Traction Company, Sedalia, Mo., has substituted buses for street cars and, if it is found that the buses meet all the needs, the present railway system will be abandoned.

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Terms of Equitable Grant Made Bankers Wary

Chairman John J. Delaney of the Board of Transportation, New York, on March 6 attributed the reluctancy of the J. G. White interests to finance the Equitable Coach Company's proposed bus operation to the opposition of the city's railway interests, as exerted through their banking and investment connections and by pressure of litigation. Mr. Delaney declared that the Board of Transportation relied upon it in recommending the granting of the franchise to that company. He is reported to have said:

> When it is known that the Chase Bank is the financial agent of the B.-M. T., that Blair & Company, Hayden Stone & Company, and other leading financial houses that deal in public utilities securities have been revealed in investigations as being large holders of the securities of the existing New York City railroad companies, it is not difficult to understand that a community of interests hostile to the introduction of any competitive element in the local transportation field was encountered by the Equitable. This community of interests did not want anyone but the present companies in complete possession of the local transit field.

On the other hand, a representative of one of the railways was quoted as saying that the pending litigation, the various forfeiture clauses, the short-term and the 5-cent fare feature of the franchise were all "red flags" to bankers, making financial houses reluctant to supply funds.

Financial *and* Corporate

Reorganization of Second Avenue Railroad Approved

Chairman William G. Fullen, of the New York Transit Commission, has informally approved a plan for operation of the Second Avenue Railroad by a corporation formed from members of the protective committee of certificate holders under a reorganization set-up. Acting on Mr. Fullen's suggestion, the Commission on March 7 approved the plan of reorganization, thus ending the receivership.

For twenty years the company's lines have been run by receivers, three of them dying while in service. Clarence J. Shearn, counsel for the certificate holders' committee, told the commission on March 1 that the operation of the lines during the past ten years by Charles E. Chalmers, the fourth receiver, was deserving of special commendation. The company today is "in excellent shape," he said, having been built up by Mr. Chalmers from a state amounting almost to complete demoralization. In his argument for taking the lines out of receivership, Mr. Shearn declared that the move would be a forward step in the progress of transportation in New York City.

The plan provides for formation of a corporation by certificate holders. It will take title by foreclosure and certificates will be exchanged for shares of stock in the new corporation on the basis of ten shares of no par value for every $1,000 certificate. A bookkeeping set-up of about $3,000,000 was agreed on as representing physical value of the property, with the understanding that it was not to be made the basis for any future rate-making case.

Offer Made for 500,000 Shares of United Gas Improvement

The United Corporation, formed early this year as a public utility holding company by the Morgan-Drexel-Bonbrigat group, on March 1 addressed an offer to the stockholders of the United Gas Improvement Company to exchange their shares for those of the United Corporation.

Not more than 500,000 of the shares will be accepted by the United Corporation, which is offering 1⅕ shares of its $3 cumulative preference stock and 2½ shares of its common stock in exchange for each U. G. I. share. This represents a value of about $200 for each $50 per share of United Gas Improvement.

Almost simultaneously it was announced that George H. Howard had been elected president and a director of the United Corporation. Mr. Howard has been identified with the public utility industry for nineteen years, and in the last ten years has devoted his time almost exclusively to legal and business matters relating to various public utility companies, particularly matters regarding their operations, financial structure and consolidation.

$49,222 Net Income on Duluth-Superior

The total operating revenue and non-operating revenue of the Duluth-Superior Traction Company and its subsidiaries for the year 1928 were $1,907,125. This represents a decrease of 4.84 per cent compared with the previous year. Operating expenses, including taxes, were $1,688,731, or a decrease of $38,369. In the annual report submitted to the stockholders it is said that the amount of paving claims against the company by the city of Duluth had been reduced during the year by satisfactory settlements to an amount not exceeding $2,500.

CONSOLIDATED INCOME STATEMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

	1928	1927
Operating revenues:		
Revenue from transportation..	$1,855,677	$1,948,393
Revenue from other operations	17,653	17,095
Total operating revenues....	$1,873,330	$1,965,489
Operating expenses:		
Way and structures..........	$190,491	$191,529
Equipment..................	209,561	194,023
Power......................	172,895	176,830
Conducting transportation....	738,024	772,140
Traffic....................	4,543	2,263
General and miscellaneous....	228,449	241,928
Transportation for investment-credit..................	—8,796	—8,275
Total operating expenses....	$1,535,169	$1,570,441
Net revenue from operations	$338,160	$395,047
Taxes assignable to operations.	$153,561	$156,659
Operating income..........	$184,599	$238,388
Non-operating income:		
Income from funded securities including interest on reacquired bonds issued by The Duluth Street Railway.	$19,216	$22,613
Income from unfunded securities and accounts..........	1,218	2,043
Income from sinking fund and other reserves including interest on reacquired bonds issued by The Duluth Street Railway..................	13,354	14,035
Miscellaneous income........	6	31
Total non-operating income	$33,794	$38,723
Gross income...........	$218,393	$277,112
Deductions from gross income:		
Interest on funded debt.......	$167,186	$168,175
Interest on unfunded debt.....	1,390	692
Miscellaneous debits.........	595	598
Total deductions from gross income.................	$169,171	$169,466
Net income transferred to profit and loss............	$49,222	$107,645

Depreciation has been accrued and charged monthly into operating expenses at the rate of 2½ per cent upon the undepreciated original cost of the depreciable street railway property and at appropriate rates on the depreciable property of a subsidiary, the Duluth-Superior Coach Company. The total amount accrued to the credit of depreciation reserve during the year 1928 was $166,999. The net amount charged against depreciation reserve during the year for renewals and retirements was $81,769. Net additions to property during the year amounted to $114,032.

NET ADDITIONS—ROAD AND EQUIPMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

Way and structures:		
Land.......................	$4,724	
Track and paving............	53,790	
Machinery and tools..........	15,215	
Distribution system...........	8,701	
Buildings and structures.......	868	$83,301
Equipment:		
Street cars and buses.........	$47,604	
Miscellaneous equipment......	2,031	49,635
		$132,936
Less Credits:		
Property retired:		
Track and paving...........	15,857	
Distribution system.........	1,877	
Street cars and buses.......	655	
Cost of selling preferred stock..	514	18,904
Net additions to road and equipment during year.....................		$114,032

A. M. Robertson, the president, states that the experience of the company during the past two years demonstrates the necessity of a readjustment of rates of fare, operating conditions and character of the equipment to be used, in all of which the city authorities and public must assist, if a reasonable return on the fair value of the property is to be earned and a satisfactory service given.

A subsidiary, the Duluth Street Railway, made substantial progress during the year in converting its two-man cars for one-man operation. This program is to be continued during 1929.

Bus service operated as feeders to the street car lines was extended during 1928 but was not satisfactory as respects earnings. This was due largely to the additional bus-miles necessarily operated.

General mortgage bonds, par value $26,000, were retired under the sinking fund provision of the mortgage.

One piece of construction work, namely, rebuilding a double track in Duluth, cost $45,252 and another improvement, the removal of a mile of track in Superior, cost $17,190.

The accompanying statements show income accounts for 1928 compared with 1927 and some statistical data on bus and railway operation.

STATISTICAL STATEMENT OF THE DULUTH-SUPERIOR TRACTION COMPANY

STREET RAILWAY AND BUS OPERATIONS

Total miles, all track reduced to single...	113.36
Total miles of street and right-of-way occupied by tracks..................	61.83
Total miles of bus routes..............	34.75
Revenue from transportation, per mile single track including miles of bus routes............................	$12,529.05
Revenue from transportation..........	$1,855,677

Short Abandonment in Fresno

The Fresno Traction Company, Fresno, Cal., has applied to the Railroad Commission for permission to abandon passenger service on that portion of its Sunnyside line on Ventura Avenue from Recreation Park easterly to the end of the company's line in Fresno County.

Net Income in Brooklyn Lower

Total operating revenues of the Brooklyn-Manhattan Transit system, Brooklyn, N. Y., for the seven months' period ended Jan. 31, 1929, were $28,112,915 compared with $27,586,215 for the seven months' period ended Jan. 31, 1928. Operating expenses increased from $17,930,308 to $18,306,475 for the 1929 period. After the consideration of income deductions, the net income was $3,545,949 for the seven months ended January this year and $3,647,033 for the seven months' period ended Jan. 31 of last year.

Petersburg Acquisition Under Discussion

Negotiations looking to the acquisition of the Petersburg, Hopewell & City Point Electric Railway, Petersburg, Va., are still in progress, although no definite action has resulted. Representatives of the Chicago interests involved went to Petersburg several weeks ago and inspected the property. A deal for the purchase of the line by Chicagoans has been considered since that time.

Stockholders of the company discussed the pending negotiations at the recent annual meeting, it was stated, but no definite action resulted. Reports made to the annual meeting showed that the past year had been a successful one for the company from a financial standpoint.

Receiver for Evansville & Ohio Valley Reports

A partial report in the receivership of the Evansville & Ohio Valley Railway, operating railway and bus lines, was filed by the receiver, William A. Carson, in the Vanderburgh County Probate Court at Evansville, Ind.

Cash receipts up to Dec. 31, 1928, totaled $73,266. Cash disbursements were $72,153, leaving a balance on hand of $1,113, with outstanding accounts totaling $9,568. The court approved the report and authorized the receiver to continue in charge of operating the company.

Another court entry authorized the railway to sell two small strips of land along the right-of-way in Spencer County, Ind., to the Indiana State Highway Commission to be used in improvement of State Highway No. 66. The receiver also was permitted to sell the company's interest in real estate, including towers, poles and other equipment along the Mt. Vernon line, which has been abandoned, to the Southern Indiana Gas & Electric Company. The company now operates buses along the Mt. Vernon highway between Evansville and Mt. Vernon, Ind.

Traffic, Fare and Wage Figures

The total number of revenue passengers, including bus passengers, reported by 223 companies to the American Electric Railway Association for the month of January, 1929, compared with January, 1928, is as follows:

January, 1929	788,065,646
January, 1928	800,254,229
Decrease, per cent	1.52

The decrease shown above is about the normal rate of decrease which has been prevailing in recent months and indicates that the decrease of nearly 4 per cent reported for the month of December was abnormal and due to the peculiar temporary conditions prevailing in that month, as was suggested in the comment in last month's service letter.

Average cash fare in cities of 25,000 population:

	Cents
Jan. 31, 1929	8.3227
Dec. 31, 1928	8.3032
Jan. 31, 1928	8.1274

The rise in the average fare during January was due to the following increases in fares granted during the month: In Minneapolis and St. Paul, Minn., the fare was increased from 8 cents cash with six tokens for 40 cents to 10 cents cash with six tokens for 45 cents. In Rochester, N. Y., the fare was increased from 9 cents cash with six tickets for 50 cents and twelve for $1 to 10 cents cash and the same ticket rates.

The average maximum hourly rates paid motormen and conductors in two-man service by companies operating 100 or more miles of single track:

	Average Hourly Rate Cents	Index Number 1913=100 Per Cent
Jan. 31, 1929	57.56	211.23
Dec. 31, 1928	57.55	211.19
Jan. 31, 1928	57.39	210.61

The increase in the average was caused by an increase of 2½ cents per hour granted to the motormen and conductors on the Illinois Terminal Railroad System at Springfield, Ill.

Election on Underliers in Philadelphia in Fall

Facing possibilities of legal delays that may consume many weeks or months, city officials and others interested in the plan to purchase the underlying companies of the Philadelphia Rapid Transit Company, Philadelphia, Pa., for $139,000,000 are reshaping their course toward a special election next fall on the proposition. Original plans called for submission of the question this spring to the voters. Now it is likely to go over to a special election after the general election next November. City Controller Hadley has persistently refused to join in the proceedings, originally because matters set forth in the city's petition were not and cannot, for extraneous reasons, be within his knowledge.

Puget Sound Interurban Right-of-Way Sought by Power Company

The Puget Sound Power & Light Company submitted the highest bid, $348,208, for the Seattle-Tacoma interurban property to Receiver Scott Z. Henderson, at the sale under foreclosure. The bid was for right-of-way and operating property. A. W. Leonard, president of the company, denied reports that the power company plans to restore railway operation. He said his company desired the right-of-way because its main transmission lines between Seattle and Tacoma are on it, and declared that, if his company is awarded the property, the tracks will probably be taken up.

Service over the interurban was discontinued by Judge E. E. Cushman, of the federal court, on recommendation of Attorney Henderson, who showed that it was not paying operating expenses and that it would be costly to rehabilitate the line. A physical valuation of $489,541 was placed on the outfit by Appraiser Henry L. Gray.

Rails Being Removed at Valdosta

The tracks of the Valdosta Street Railway, Valdosta, Ga., long in disuse, are being removed from the streets. Five years ago the cars ceased to operate and about two years ago the wires were taken down, but the rails remained. Recently a deal was closed whereby it was possible to get the tracks taken up and the street restored to its original condition for the price paid for the rail. The railway consisted of 5.25 miles of line.

Revenue in Quincy Falls Off

Although bus revenue in Quincy, Ill., showed a marked increase last year over 1927, the Illinois Power & Light Corporation reported total revenue from street cars and buses during the year of $208,201, as against $244,771 in 1927 and $263,722 in 1926. The 2 per cent franchise tax, payable to the municipality, amounted to $4,364, the smallest check the city had received from the transportation system in three years. Detailed revenue report included: Receipts from street cars and buses, cash fares, $25,262 and $3,780, respectively; from tokens used on street cars and buses, $70,172 and $86,650; chartered street cars, $81 and buses, $307.

Haverhill-Salem Service to Stop

The Massachusetts Northeastern Street Railway, Haverhill, Mass., is to discontinue service between Haverhill and Salem, N. H., on March 17. Cars will operate to Ayers Village. The Salem carhouse will be sold and tracks beyond the New Hampshire line removed.

Book Reviews

Black on Rescission and Cancellation

Henry C. Black and Hon. Jay M. Lee. Published by Vernon Law Book Company, Kansas City. Three volumes (second edition). Price $30.

The first edition, published in 1916, became an outstanding legal text. The steady development of this branch of the law rendered a fuller treatise necessary. Part One deals with the discussion of rules and principles and contains a detailed examination of the various causes or grounds which justify the rescission or repudiation of a contract by one of the parties to it, or which warrant a court in ordering its annulment or cancellation. A valuable feature of the new edition is the greatly enlarged index.

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Standards Yearbook—1929

Compiled by the National Bureau of Standards, George K. Burgess, director. Published by superintendent of documents, government printing office, Washington, D. C. Price $1.

Suggestions and data for all engaged in standardization will be found in the "Standards Yearbook for 1929." The many aspects of the subject call for a concise summary for busy men who most need to keep in touch with the latest advance in the standards field. The yearbook is designed to meet this need. It consists of eleven chapters, covering standardization of commercial weights and measures; standardizing the calendar; international standardizing agencies; national standardizing agencies; federal standardizing agencies; National Bureau of Standards; municipal, county and state agencies; general standardizing agencies; standardizing activities of technical societies and trade associations; bibliography on standardization for 1928, and an index.

It is the third issue of an annual which has proved indispensable to all interested in any phase of standardization in America and abroad. It summarizes and brings up to date current standardization activities and accomplishments in this country and elsewhere for the past year.

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Steel Masts and Towers

"Mäste und Türme in Stahl." By P. Sturzenegger. 219 pages, 362 illustrations. Published by Wilhelm Ernst & Sohn, Berlin W 8, Wilhelmstrasse 90. Paper, 23 Reichsmarks; linen, 25 Rm.

Due to the need of steel structures for the support of wires in carrying electric current for lighting, power and railway purposes, there has arisen a demand for information relative to the design of poles and towers for this invention. This book gives details of the design and construction of many of the types used in European installations. An entire section of 30 pages is devoted to structures for railway purposes, including special towers for substations. Other sections include the principles and development of transmission structures, high-tension power transmission, anchoring and grounding of towers, protection against corrosion and erection.

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Budget Control—What It Does and How to Do It

Issued by Ernst & Ernst, public accountants, New York. 40 pages.

How each part of the business budget should be prepared and the principles of its effective operation, together with a summary of benefits, are set forth in this revised edition of a work published by the authors four years ago. It has been widely used for informative and reference purposes by business executives, engineers and various students of business methods.

The book begins by defining the budget as a plan for co-ordinating all forces and directing them toward the attainment of a definite objective. According to the book, the budget estimates in advance the factors of time, volume and value necessary to produce a definite amount of sales and profit in a given period. It forecasts production, income, expenditures, financing, profit and financial position.

The procedure in preparing the master budget and its preliminary essentials represented by the budgets for sales, production and purchases, expense, plant additions and plant changes, and for cash proceeds, disbursements, balances and financing, is discussed concisely. The pages given to the classification of expense for budget purposes treat the subject in relation to manufacturing, wholesale and retail establishments.

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Labor Management

By Gordon S. Watkins, Professor of Economics, University of California. A. W. Shaw Company, Chicago. 720 pages, price, $5 net.

In an analysis and interpretation of the principles of labor management whatever solutions are forthcoming will be born of three important conditions, namely: (1) An intelligent understanding and scientific interpretation of the forces of evolution which have produced modern industrialism; (2) a scientific investigation of employment conditions, which appear to be the basic causes of working-class revolt; and (3) the application of workable methods of improving employment relations. With this outline as a basis, the author proceeds to develop the subject matter, setting forth the basic assumptions of enlightened personnel administration. Next he points out that, if we would understand the intricate maladjustments in current industrial relations, we must have a clear perception of the economic antecedents strewn along the pathway of history.

In Part III, such topics as instincts, repression, acquisitiveness, gregariousness, sex and parental bent, fear and reason are discussed. In Part IV is an outline of the general principles of administrative science and a summary of the task and qualifications of the personnel manager. Part V takes up the selection and placement of workers, and job analysis and specifications. Part VI deals with education and training of employees.

◆

Commerce Yearbook—1928

Published by the Department of Commerce, Bureau of Foreign and Domestic Commerce. Vol. 2, 750 pages. Price $1.25.

This volume gives in abbreviated form the same type of information on foreign countries as Vol. 1 presented on the United States. Vol. 1 is now available and Vol. 2 is expected to be off the press by Sept. 1. The two volumes constitute a complete and authentic picture of the trade and industry of the world during 1927.

◆

Electric Drive Practice

By Gordon Fox. Published by McGraw-Hill Book Company, New York City, 1928. 421 pages; illustrated. Price $3.50.

"Electric Drive Practice" is a companion book to "Principles of Electric Motors and Control" by the same author. The present volume deals with classes of driven machinery which are in common use in many industries. Particular attention is given to the factors governing selection and application of motors and control equipment. Other general topics include mechanical and electrical features of motor installations. Separate chapters are taken up with consideration of motor drive for various special types of machinery such as centrifugal fans, blowers and compressors, air compressors, pumps, traveling cranes, conveying and elevating machinery and machine tools. Another separate chapter is given to industrial electric traction. To make the book more useful a bibliography is included at the end of nearly every chapter which gives the latest references.

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The Engineering Index Service

This Engineering Index Service, instituted in January, 1928, is to be found in the public libraries of Newark, Cleveland, Bridgeport, Baltimore and the John Crerar Library, Chicago. Engineers in any field who live or work in New Jersey will find this mammoth index to the latest engineering literature, in the Public Library of Newark, N. J. The library is open daily from 9:00 to 9:30 and is convenient to all railroad stations. It answers inquiries by mail or by telephone.

Personal Items

James P. Griffin Succeeds Jack Beall at Dallas

James P. Griffin was elected president of the Texas Electric Railway, Dallas, Tex., on March 5, succeeding the late Jack Beall. For the present Mr. Griffin will continue to be executive in charge of operations.

Continuously since 1905 with the Dallis outfit, Mr. Griffin has, since July 1, 1926, been serving as active vice-president in charge of operations. His first railway experience was at Waxahachie in the general freight and passenger office of a subsidiary of the Southern Pacific. Prior to his going to Dallas in July, 1905, he was secretary to Jack Beall for one year during 1904 and 1905 while Mr. Beall was in Congress. With J. F. Strickland he was engaged in the project to build an interurban railway from Dallas to Sherman. This project was successful and that line was put in operation on July 1, 1908. Later he served as secretary and general passenger agent and auditor of these lines. On April 1, 1912, Mr. Griffin became also secretary of the Southern Traction Company, then building the interurban lines from Dallas to Waco and Dallas to Corsicana. These lines were put in operation in October, 1913. He also served as general passenger agent for these lines. On Jan. 1, 1917, the Texas Traction Company and the Southern Traction Company were consolidated under the name of the Texas Electric Railway and he was elected secretary and appointed general passenger agent of that company. Nearly six years ago he was elected vice-president of the Texas Electric Railway.

James P. Griffin

Mr. Griffin was born in Waxahachie, Tex., on Jan. 28, 1881. He attended the University of Texas after being graduated from the Waxahachie High School in 1900. He inaugurated the Bluebonnet Limiteds, operating from Waco, Corsicana and Denison and made this service a popular one. He is also credited with conceiving the plan of converting the interurban passanger lines into joint passenger and freight hauling lines, and, with the late Jack Beall, secured an amendment to the company's charter and permit from the Railroad Commission to enter this field in May, 1928. He is a vice-president of the Southwestern Public Service Association.

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F. W. Bacon Heads Bus Company Taken Over by Railway

F. W. Bacon, New York City, vice-president Kentucky Securities Company, holding company of the Kentucky Traction & Terminal Company, which recently purchased a majority interest in the Consolidated Coach Corporation, has been elected president of the coach corporation. He succeeds Guy H. Hughlet, Lexington, who was elected vice-president and general manager. As indicated in the item in the ELECTRIC RAILWAY JOURNAL for Feb. 16, page 300, the Coach Company operates a large network of bus lines over the state and into several adjoining states.

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W. J. Harvie With Omaha & Council Bluffs Company

William J. Harvie, employed by the United Traction Company, Albany, N. Y., for two years as safety director, will become efficiency engineer of the Omaha & Council Bluffs Street Railways, Omaha, Neb.

Many safety measures adopted by the company in Albany in the last two years, instrumental in reducing accident rates considerably, were suggested by him for use on the Albany system.

Mr. Harvie was formerly vice-president Auburn & Syracuse Railway, general manager of the Syracuse & Suburban Railway and chief engineer Syracuse Rapid Transit and the Oneida Railway and the Utica lines. He was also chief engineer in charge of the electrification of the West Shore between Utica and Syracuse.

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FRANK H. WARREN, who recently announced his candidacy for the Republican nomination for city judge of South Bend, Ind., has resigned his position as claim agent for the Chicago, South Bend & Northern Indiana Railway. His resignation coincides with the railroad's policy of non-participation in politics, Mr. Warren said. In his letter of resignation, he expresses his appreciation of his relations with the electric line.

R. L. LONGSHORE has been appointed general manager of the Toledo & Western Railway, at Toledo. He succeeds H. O. Kelly, who has been appointed superintendent of the Springfield, Ill., division of the Wabash Railway.

W. H. Harton—President of Kentucky Association

W. H. Harton, general manager Cincinnati, Newport & Covington Railway, Covington, Ky., was elected president of the Kentucky Association of Public Utilities at the recent meeting of the organization held at Louisville. Mr. Harton is well-known for his work in directing the Green Line street cars, and is one of the few general managers concerned with the problem of giving interstate transportation to the public for a 5-cent fare.

He served his apprenticeship in the office of a civil engineer who represented various satellite communities around Cincinnati in an engineering capacity. In August, 1892, Mr. Harton entered the employ of the Cincinnati, Newport & Covington Railway as a levelman in the engineering corps. The local horse car lines were then being consolidated and the motive power was being changed over from old dobbin to electricity. It was at a time when the then existing trackage was being reconstructed, preparatory to operating the heavier units, and new construction work was in progress on all parts of the system. This gave the young levelman work to do that took him to all parts of this northern Kentucky system.

W. H. Harton

He helped rehabilitate this system and, when the new trackage was completed, he became chief clerk to the superintendent. In 1898 he was appointed superintendent maintenanceg of way. On June 2, 1915, he stepped up to general superintendent and was promoted to general manager in December, 1919. As the man who keeps the Green Line moving, he is expected to make many improvements in the road if communities served heed the request of H. C. Blackwell, president, for a higher fare.

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J. L. Fritsch Elected Vice-President of West Penn Railways

J. L. Fritsch of Pittsburgh was recently elected vice-president of West Penn Railways and Wheeling Traction Company in charge of engineering and promotional work. Mr. Fritsch has been chief engineer of the West Penn Railways since its organization.

Early in his career he was employed by the Cincinnati Water Works Commission on the design and construction of their new plant located at California, Ohio. On March 17, 1902, he went to Connellsville with the original Pittsburgh, McKeesport & Connellsville Railway, when the various small, isolated railway lines were being connected up to make a completed system. In October, 1903, Mr. Fritsch became chief engineer of that road, and has continued in that capacity with the West Penn Railways to date. In June, 1915, he went to Pittsburgh in charge of supervision of the track and roadway departments of the Wheeling Traction Company as well as of the lines in Pennsylvania.

Mr. Fritsch was born in Cincinnati, Ohio. He was graduated from that city's university in civil engineering in 1897. His most recent promotion was announced by H. L. Mitchell, president of the West Penn Railways.

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Rolla Wells Honored in Bank Designation

Rolla Wells, who was receiver for the United Railways Company, St. Louis, prior to the purchase of the St. Louis street car system by the St. Louis Public Service Company, effective on Dec. 1, 1927, has been designated by the Federal Reserve Board at Washington as chairman of the board for the St. Louis Federal Reserve Bank, succeeding William McMartin, resigned. A former Mayor of St. Louis, Mr. Wells had been governor of the bank from its organization in November, 1914, to February, 1919, following which he was elected a Class B director, representing the group of agriculture, industry and commerce. He continued in that capacity until his appointment as chairman, which changes his status to that of a Class C director, a direct representative of the government. He was receiver for the United Railways from April, 1919, to Dec. 1, 1927.

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Frank H. Miller, vice-president and general manager of the Louisville Railway, Louisville, Ky., was elected president of the Louisville Safety Council to succeed William L. Hoge at a recent meeting of the twelve directors.

John Aldworth, who recently retired as general manager of the Nottingham Corporation Tramways, England, after a service of 30 years, has been retained by the City Council as consultant. He has also been elected an honorary member of the Municipal Tramways & Transport Association in recognition of his service to the association, of which he was president in 1907-1908.

Walter O. Randlett, for many years secretary to the general manager of the electric department, Virginia Electric & Power Company, Richmond, Va., and recently promoted to the position of statistician, has now become a member of the comptroller's staff.

B. A. Hegeman, Jr., Dies Suddenly

Head of National Railway Appliance Company a leader in electric railway, bus and steam railroad transportation

Benjamin Arrowsmith Hegeman, Jr., well known in electric railway, bus and steam railroad transportation circles, died suddenly of heart attack at his home in New York on March 6. He was president of the National Railway Appliance Company of New York, president of the Hegeman-Castle Corporation of Chicago, president of the Anglo-American Varnish Company of Newark, N. J., and of the Genesco Corporation of Rochester, N. Y., and director of the Excelsior Savings Bank of New York. He was president of the Railway Supply Manufacturers Association in 1914 and a member of the American Electric Railway Association.

Photo by Blank and Stoller

B. A. Hegeman, Jr.

Few men in electric railway work, certainly very few men engaged in manufacturing and sales activities, gave of their time more freely to the work of the American Electric Railway Association than did Mr. Hegeman. His record of committee activities stretches down the years in a long unbroken line, containing many assignments quite arduous in the tasks they imposed. Still Mr. Hegeman was never known to falter when the desire was expressed in association councils that the weight of his experience might prove helpful. This year found him serving on the convention location, the manufacturers' contact and the exhibit committees, while last year he was a member of the exhibit committee and the year before that—1926-1927—he was a member of the American executive committee and the committee on finance. In 1925-1926 he served on three committees, executive, exhibit and finance. In 1924-1925 he served on two committees, the American executive and the finance. In 1923-1924 he was a member of the American executive committee and the convention location body. And so the record goes. It is a partial list, but there appears to be no need to expatiate for the benefit of men in the electric railway industry on what all this has meant to the railways. Both in manufacturing circles and in the railway industry Mr. Hegeman's record is so outstanding that no encomium on the work of the man would serve to enhance that record or mitigate the loss to the industry and the men actively engaged in it suffer by his death.

A son of Benjamin Arrowsmith Hegeman and Jane Roome, Mr. Hegeman was born in New York City on July 14, 1860. He was descended from Holland Dutch and English Colonial ancestry. He attended the public schools and was graduated from the Mount Washington Collegiate Institute in 1877. After eight years in the freight, passenger and treasurer's offices of the Delaware, Lackawanna & Western Railroad, he went to the Citizen's Mutual Life Insurance Company as cashier and assistant secretary. Eighteen months later he became general manager of the Lackawanna Live Stock Transportation Company, a position which he held for eleven years, until he became Eastern sales agent for the American Car and Foundry Company. In 1901 he was elected president and director of the United States Metal & Manufacturing Company.

On Oct. 23, 1883, Mr. Hegeman married Miss Kate Greenough Matthews, a daughter of Charles Matthews. He took an active interest in Republican politics, having been a Councilman and then Mayor of North Plainfield, N. J. For many years he was a member of the Republican Executive Committee.

His clubs included the Lotus, Automobile of America, Sleepy Hollow Country, Railroad, Baltusrol Golf, Apwamis, New York Athletic and the Lyres. Besides his son, daughter and wife he left five grandchildren.

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Thomas Andrew Turner, the first motorman to take a north side elevated train around the union "loop" in downtown Chicago, died on Jan. 18. He was also the first motorman to take an elevated train into the city of Evanston in 1905. Mr. Turner was born in 1853.

George Lee Estabrook, with the banking firm of E. W. Clark & Company for 41 years, died on Feb. 14 in Philadelphia, Pa. At the time of his death, as a firm representative, he was president of the Crystal Oil Refining Corporation, Shreveport, and secretary and treasurer of the Portland Electric Power Company, Portland, Ore. Mr. Estabrook was born at Athens, Pa. After being graduated from the Eastman Business College, Poughkeepsie, N. Y., he became a stenographer with E. W. Clark & Company and was quickly advanced.

Construction Programs Planned

One million dollar improvements to be made by the Omaha & Council Bluffs Street Railway. Illinois Power Company plans extensive improvements. Chicago Orders Cars. Cincinnati starts track construction

MORE than $1,000,000 will be spent for improvements by the Omaha & Council Bluffs Street Railway, Omaha, Neb., during the coming year, according to announcement made by Chester D. Porter, vice-president in charge of operation. Half of the sum will be spent for the changing of routes and the improvement of track equipment and cars, and the other half will be used for the expansion and relocation of substations for the better conservation of power. W. J. Harvie, of Albany, N. Y., a consulting engineer experienced in street railway problems, has been called to Omaha by John M. Shannahan, president of the Omaha & Council Bluffs Street Railway, to aid in the suggested improvements. The special points to be studied by Mr. Harvie are the power requirements of the system, the car equipment and the shop facilities.

IMPROVEMENTS IN SPRINGFIELD

Ten new street cars and five new buses are included in the equipment which the Illinois Power Company, Springfield, Ill., will add to its railway system this summer. Final plans have also been completed for the construction of a $114,500 garage, work on which is now awaiting the selection of a suitable site. The new cars will be slightly smaller than the cars now employed on the Fifth Street line in the downtown district. When the new cars are received ten of the old cars will be destroyed.

The Illinois Power Company has a budget of $616,989 for construction work in its various departments in the city and, according to A. D. Mackie, general manager, it is expected that $200,000 more will be added before the final plans are completed. At present the railway's share in the budget is $178,117.

In Lynchburg an agreement has been reached between officials of the Lynchburg Traction & Light Company and City Manager W. B. Hart under which the street work to be done by the railway in street car track areas of the city is not to exceed $8,500 a year.

Plans for expansion of its facilities in the East and the Mid-West, involving the establishment of three new dispatching centers, were announced recently by the Piedmont & Northern Railway, Charlotte, N. C. Two freight offices at Charlotte and one in Cincinnati, Ohio, will be opened this month. The company now has offices at New York, Atlanta, and Dallas.

The Jamestown, Westfield & Northwestern Railroad, Jamestown, N. Y., operating an electric interurban service between Jamestown and Westfield, has completed a program of improving the interior seating arrangement of its cars. The new seats installed are the Pullman parlor-car type, single seats being installed on swivels on one side and stationary double seats on the other.

CINCINNATI STARTS TRACKWORK

The Cincinnati Street Railway, Cincinnati, Ohio, has started relaying track from Broadway to Smith Street, on Fourth Street, a total distance of 4,482 ft. The tracks will be laid in the center of Fourth Street and will be single tracks to replace the double trackage formerly existing in that street, which has become a one-way thoroughfare.

Work will be commenced from both terminals and a temporary track system will be used for street car operation, thus facilitating the work. One hundred and twenty-two-pound grooved rail will be laid and the city will resurface the street following the completion of the new track and a new water main. This Fourth Street track renewal is the second major downtown track improvement of the Cincinnati Street Railway under its extensive program for rehabilitation.

The Public Service Co-ordinated Transport, Newark, N. J., will install for trial purposes on some of its cars, air-operated automatic gong ringers. The devices will be first installed on the parlor cars now being put into service on the Central Avenue and Orange lines in the Essex division.

SEATTLE IMPROVEMENTS

An immediate appropriation for new construction work, necessary for the rerunning of West Seattle Street cars on the Spokane Street elevated down to First Avenue south, is requested of the Seattle City Council. Approximately $100,000 will be needed for this construction. According to the superintendent of utilities, the rerunning plans contemplate elimination of the Elevated Street Railway on Whatcom Avenue between Spokane and Washington Streets. The cost of repairing this strip of railway structure and making it safe for continued use is said to be almost prohibitive.

According to Commissioner Ira S. Davisson, the seven used street cars for the municipal belt line, recently ordered by the city, will probably be rejected. It is claimed that a city inspection has revealed that it will cost at least $1,000 per car to recondition the cars if accepted. The cars were to replace those now rented from the Tacoma Railway & Power Company.

Syracuse Railway Co-ordinated Bus Lines, Syracuse, N. Y., which is controlled by the New York State Railways, has ordered five model AB four-cylinder Mack bus chassis and four 233-in. Mack model BK six-cylinder bus chassis. The Los Angeles Railway, Los Angeles, Cal., has placed orders for four urban type Twin Coaches. The Chicago & West Towns Railways, Chicago, Ill., has received five Mack model AB 225-in. bus chassis and one Mack model AB 29-passenger city type bus.

CHICAGO ORDERS CARS

Chicago Surface Lines, Chicago, Ill., has placed an order for 33 cars with the Cummings Car & Coach Company and another order for 33 cars with the J. G. Brill Company. The remaining 34 of the lot of 100 will be built in the company's own shops.. As mentioned in the Feb. 9 issue of the JOURNAL, these cars are of the large front-entrance, center-exit type. They are for two-man operation and are equipped with sufficient motor power to give quick acceleration and high running speed. Each car seats 60 passengers. Loading and unloading are facilitated by double and single folding entrance doors and double and single sliding exit doors.

MATERIALS ORDERED

The Capitol Traction Company, Washington, D. C., has recently placed orders for 275 gross tons of 7-in. 103-lb. A.E.R.E.A. grooved girder rail. This company has also ordered 530 International Steel twin ties. 300 Thermit rail welding portions, 35 gross tons of cast-iron track yokes and manhole castings for underground conduit track construction, 22 tons of malleable iron special track castings for underground conduit track, one carload of track bolts, special hook head bolts, washers, etc.

The Dallas Railway & Terminal Company, Dallas, Tex., has placed orders for one carload of creosoted pine poles and 150 21-in. rolled-steel wheels. The Portland Electric Power Company, Portland, Ore., has ordered three buses costing $35,713.

Ten tons of 500,000-circular mill cable and 6,000 No. 00 bronze trolley ears have recently been ordered by the Toronto Transportation Commission, Toronto, Ont. This railway has also ordered 300 33-in. motor wheels, 200 30-in. motor wheels, 200 26-in. motor wheels, 100 22-in. motor wheels and two sightseeing launches of 29-passenger seating capacity. The Washington Railway & Electric Company, Washington, D. C., has placed orders for 200 cedar poles,. 500 ft. of 9-in. road rail, 500 ft. of 6-in. road rail, 700 cast-iron track yokes, and 3 surface branch offs. This company also has placed orders for one Greenfield threading machine, one Westinghouse air compressor and 36 sets of Westinghouse vacuum brakes for type Z coaches.

United Railways Electric Company, Baltimore, Md., plans a motor bus service and repair building to cost approximately $275,000. The Wisconsin Power & Light Company, Madison, Wis., will soon take bids for an addition to the power plant to cost $50,000.

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Exhibitograph No. 5

MANUFACTURERS!

Have you made your plans to

Exhibit

at the

48th

A.E.R.A. Convention?

Applications for exhibit space will be mailed

APRIL 12

Buses for Public Service to Have New Features

In placing an order for 267 new buses with the Yellow Coach & Manufacturing Company, the motor coach division of General Motors Truck Corporation, it is announced by Public Service Co-ordinated Transport, Newark, N. J., that the buses will have the best system of heating and ventilation that has yet been placed in service by the company. In addition, the most modern braking equipment and engines of considerable more power than have so far been used will be installed.

The heating and ventilation will be accomplished by means of an improved hot-air system by which air is blown by electrically-operated fans over coils of hot water from the radiator. This uniformly heats the bus throughout and makes for better ventilation.

All the chassis and a few of the bodies will be built at the Pontiac, Mich., shops of General Motors but the majority of the bodies will be built at the Public Service shops in Newark. When these buses have been placed in service, Public Service will have a fleet of 2,000 buses actually in operation. The entire electrical equipment will be furnished by the General Electric Company.

The new buses will be of both the gas-electric and gas-mechanical types, the gas-electrics being used in city service and the gas-mechanics on suburban and long distance lines.

The engines will be the sleeve-valve, silent Knight type, with six cylinders. They will have higher compression and more power than those now in service.

The buses will be equipped with balloon tires, something new on the so-called city service type of bus, and will have leather seats, both of these features designed to give the greatest possible comfort to the passengers.

On the gas-eleectric drive buses there will be three sets of brakes as follows:

Westinghouse service brakes with brake shoes on rear wheels.

Independent emergency brakes on electric motor shafts operated by a hand lever.

Another set of independent electric brakes operated by the controller.

The first delivery on the order is expected sometime in May. In the meantime the bodies are already being built at the Newark shops and, as fast as the chassis arrive, they will be attached to the bodies.

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Specifications on Northwestern Pacific Cars

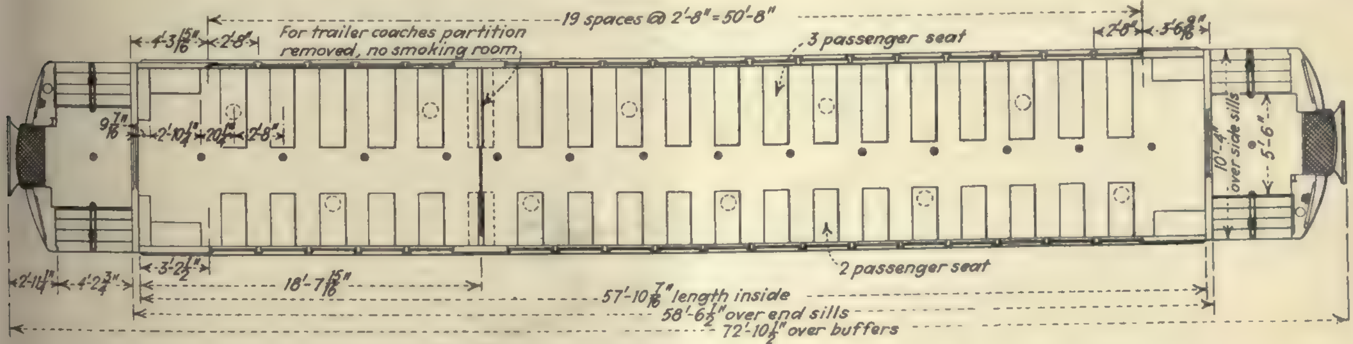
Five motor cars and five trail cars have recently been ordered by the Northwestern Pacific Railroad, San Francisco, Cal., from the St. Louis Car Company, as mentioned in the Dec. 8 issue of ELECTRIC RAILWAY JOURNAL. The motor passenger cars are of the two-man, interurban type of double-end, double-truck construction. Each car is 72 ft., 10½ in. long, 10 ft. 6 in. wide and seats 98 passengers. The bodies are of all-steel construction with aluminum arch type roofs. They are heat insulated with balsam wool, the interior having aluminum trimming. The seats are leather upholstered, being of three-passenger size on one side of the car and two-passenger on the other. Each motor car is equipped with an 18-ft., 8-in. smoking compartment and is also provided with a folding operating cab in each end. The smoking compartment seats 29 passengers.

The motor trucks have a 7-ft., 3-in. wheelbase and are equipped with inside-hung motors, 33-in. rolled steel wheels and plain type journal bearings. No trolleys are provided as power is collected through third-rail devices.

The trail cars are exact duplicates of the motor cars except that they have no smoking compartments and have a seating capacity of 103 passengers, two seats replacing the partition. These trailers are also equipped with controllers and have a truck wheelbase of 6 ft. Additional details are given in the accompanying specifications.

J. G. White Rebuys British Firms

J. G. White & Company, Inc., has announced the repurchase by them of J. G. White & Company, Ltd., of London, and in the forthcoming annual report will disclose the sale of the J. G. White Management Corporation to J. H. Pardee and J. I. Mange, president and vice-president, respectively, of the J. G. White Management Corporation. The latter company, it is now disclosed, was sold early in 1928, although no



Floor plan of the cars being built for the Northwestern Pacific Railroad by the St. Louis Car Company

Length over all	72 ft. 10½ in.
Length over body posts	58 ft 6½ in.
Truck wheelbase	7 ft. 3 in.
Width over all	10 ft. 6 in.
Height, rail to top of roof	13 ft. ½ in.
Window post spacing	2 ft. 8 in.
Body	All steel
Roof	Aluminum arch
Air brakes	Westinghouse
Axles	Forged steel tempered and quenched
Conduit	Metal
Control	Westinghouse multiple unit
Couplers	Westinghouse automatic car air and electric
Curtain fixtures	Adams & Westlake
Curtain material	Pantasote J-86-M
Door mechanism	National Pneumatic operating interlocking and signal for sliding gates
Doors	Sliding, partition end type
Floor covering	Flexolith
Glass	Plate in doors and ends-DSAA in side sash
Hand brakes	Miner
Heat insulating material	Balsam wool
Heaters	Railway Utility single unit truss plank
Headlining	Agasote
Interior trim	Aluminum
Journal bearings	Plain
Journal boxes	Malleable iron
Motors	Westinghouse No. 557-E-7, inside hung
Registers	Ohmer
Sash fixtures	O. M. Edwards
Seats	Hale & Kilburn
Seat spacing	2 ft. 8 in.
Seating material	Leather
Steps	Stationary
Step treads	Kass
Trucks	St. Louis-Commonwealth
Ventilators	Globe
Wheels, type	Rolled steel 33 in. diameter
Wheelguards or fenders	Plain

formal announcement has heretofore been made. These changes leave J. G. White & Company, Inc., with two subsidiaries, namely, the J. G. White Engineering Corporation and J. G. White & Company, Ltd., of London.

The British company, organized more than twenty years ago by J. G. White, was sold to their interests at the outbreak of the World War. Increasing foreign business of J. G. White & Company, Inc., and the J. G. White Engineering Corporation is the reason given for the recent repurchase, arrangements for which were made by J. Dugald White, vice-president of the New York company. The British subsidiary, which until this time has been engaged chiefly in engineering activities, will have facilities for acting in the investment banking field as well.

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Railway Construction in Italy

The only means of communication with the Republic of San Marino, in the heart of Italy, is by carriage or motor from Rimini, the nearest Italian city having railway connection, a distance of 15 miles, according to Consul Joseph Emerson Haven, Florence. Direct railway connection with the capital of the republic has long been desired by the San Marinese, and on March 26, 1927, a convention between the Kingdom of Italy and the Republic of San Marino was signed, with regard to the erection of an electric railway line, the construction of which was assigned to an Italian company. Work was commenced on Dec. 2, 1928, and it was announced at that time that the line would be completed and in operation in two years. Ten tunnels will be necessary, and near the town of Serraville a bridge will be required across the Ausa River. It is thought that there may be opportunity for American business, although rolling stock, electrical material, etc., will be of Italian production in so far as possible.

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Weekly Business Conditions

The volume of trade during the week ended March 2, as reflected by check payments, was smaller than in the preceding week but greater than a year ago, according to the weekly statement of the Department of Commerce. Industrial activity, as indicated by operations in steel plants, was also greater than during either comparative period. The production of bituminous coal during the latest reported week, while somewhat lower than during the preceding week, was substantially larger than in the similar week of 1928. The output of lumber showed a gain over the preceding week but a decline from a year ago. Petroleum production was running considerably in excess of last year. Freight-car loadings covering the latest week showed a gain over the corresponding period of 1928.

Prices for copper, cotton, iron and steel were generally higher than in either prior comparative period. Loans and discounts of federal reserve member banks showed only slight change from the preceding week but were higher than a year ago. Interest rates on call loans averaged higher than in either the preceding week or the similar week of last year. Bond prices averaged lower than in either period. Prices for stocks showed gains over both periods.

METAL, COAL AND MATERIAL PRICES F.O.B. REFINERY

	March 5, 1929
Metals—New York	
Copper electrolytic, cents per lb.	19.275
Copper wire, cents per lb.	21.375
Lead, cents per lb.	7.25
Zinc, cents per lb.	6.7
Tin, Straits, cents per lb.	48.875
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.425
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.80
Franklin, Ill., screenings, Chicago, net tons.	1.425
Central, Ill., screenings, Chicago, net tons	1.075
Kansas screenings, Kansas City, net tons	1.70
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.35
Weatherproof wire base, N. Y., cents per lb.	22.375
Cement, Chicago net prices, without bags	2.05
Linseed oil (5-bbl. lots) N. Y., cents per lb.	11
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.5
Turpentine (bbl. lots), N. Y., cents per gal.	61.5

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Improvements to Be Made in London

Extensive improvements are to be made during this year by the Underground Electric Railway, London, England, according to a recent announcement by that company. Escalators are to be installed at Highgate and Camden Town stations, and the Charing Cross station improvements will be completed. A number of stations will be rebuilt and improved, and the new Underground Building at St. James Park station will be completed. An automatic ticket system will also be introduced at this station.

Three hundred and seventy-two additional cars were put into service on the Hampstead and City, Bakerloo and Piccadilly tubes. Ninety-one new motor cars will be placed in service on the District Railway. Many additional improvements will be made including the installation of a 15,000-kw. set, new boilers and new switchgear at the Lots Road Carhouse.

More than 1,000 omnibuses will be equipped with pneumatic tires. The Elmers End garage will be completed and two new garages will be constructed in north and west London. New motor coaches will be introduced for private hire service. Two new cars of the modern type will be added and the uncovered topped cars will be converted into covered cars. Additional cars in the South Metropolitan Electric Tramways will be remodelled.

Weekly Business Indicators

(Weeks ended Saturday. Average 1923 — 25 = 100)

	1929				1928			
	Mar. 2	Feb. 23	Feb. 16	Feb. 9	Mar. 3	Feb. 25	Feb. 18	Feb. 11
Steel operations	.....	117.1	114.5	113.2	109.0	111.0	112.0	111.0
Bituminous coal production	.....	120.7	122.5	124.1	103.0	104.4	96.2	100.0
Lumber production	.....	96.4	84.1	81.8	101.4	108.6	106.4	104.5
Petroleum production (daily aver.)	.....	.....	128.4	129.3	113.2	112.8	113.4	113.3
Bldg. contracts 37 states (daily av.)	124.5	93.1	85.1	79.8	111.0	122.2	114.9	117.3
Price iron and steel, composite	87.9	87.6	87.6	87.6	86.5	86.0	86.0	86.0
Copper, electolytic, price	.....	129.0	129.0	129.0	100.0	100.0	100.0	100.7
Bank loans and discounts	.....	129.5	129.9	130.1	121.2	120.4	121.1	121.3
Interest rates, call money	187.9	169.7	169.7	163.6	109.1	103.0	109.1	112.1
Business failures	131.9	101.0	117.0	135.1	126.8	118.7	127.8	134.2
Interest rates, time money	177.1	177.1	177.1	171.4	105.7	105.7	105.7	102.9
Federal reserve ratio	90.2	91.4	90.1	89.4	95.6	96.4	95.5	95.6

TRADE NOTES

Nachman Spring-Filled Corporation, Chicago, Ill., recently purchased the plants and business of the National Spring & Wire Company and the Marshall Company, Grand Rapids, Mich. The Grand Rapids plants will operate as the automotive division of the Nachman Spring-Filled Corporation under the name of the National-Marshall Spring Corporation by Mr. James L. McInerney, former president. In addition to assuming the presidency and direction of the National-Marshall Spring Corporation, Mr. McInerney will be retained as an executive of the Nachman Spring-Filled Corporation. The Nachman factory at Los Angeles, Cal., will continue to serve the Pacific coast enterprises as it has in the past.

H. A. Baker, of Schenectady, N. Y., has been appointed service manager of the International General Electric Company, with headquarters in New York City. Mr. Baker succeeds C. F. Neave, who has been named manager of the newly organized refrigeration department of the company.

George H. Scragg is once more actively associated with the Mack International Motor Truck Corporation, New York, N. Y. Mr. Scragg has only recently returned from an extended trip which took him to the West Indies and Europe.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., announces that it has acquired the business of the Trumbull Vanderpoel Electric Manufacturing Company, Bantam, Conn., which will be operated as a subsidiary of the Cutler-Hammer company under its present name. This purchase will add a complete line of meter service and safety switches to the present Cutler-Hammer line of motor control, wiring devices and allied electrical items.

Caution vs. Precaution

Caution means the exercise of proper care. Precaution, on the other hand, means guarding against future accidents well in advance.

It's the motorman's job to exercise the former, but it is your responsibility to take the latter. In the matter of handbrakes, there is no better precaution than

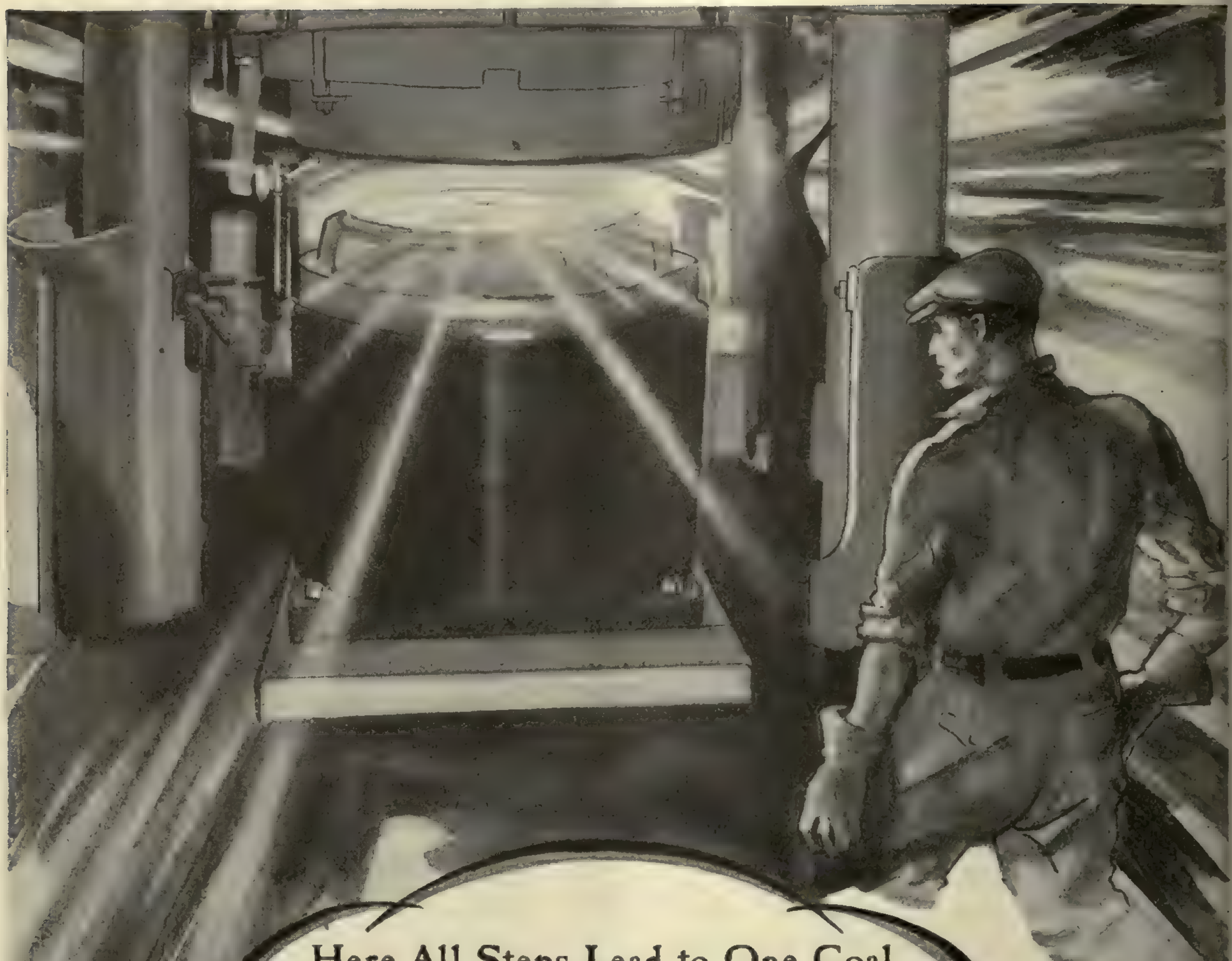
PEACOCK STAFFLESS BRAKES

For Peacock Staffless Brakes are *precaution* against the unexpected. They are fast and powerful in braking, when speed and braking power are at a premium. But what is more important, they always function, in spite of slack rigging or worn brake shoes, for they take up an unlimited amount of chain without clogging.

Just think this over when you come to specify handbrakes. An ounce of precaution on your part is worth a ton of caution on the part of your motormen.

NATIONAL BRAKE CO., Inc.

The
Peacock
Staffless



Here All Steps Lead to One Goal
...Multiplied Mileage

In the coning operation—last of the "hot" operations—the Gary Wheel, having been forged, rolled and punched, is placed in the loose dies of a press, where sufficient pressure is exerted by the ram [also equipped with loose dies] to give the web the proper curvature, or "cone." Here minor variations in rotundity are also corrected. . . . . . . From wheel blank to finished product, the process of making Gary Wheels is a series of "steps" leading directly to Multiplied Mileage. The buyer receives the advantage of modern equipment, careful manufacture and painstaking inspection, resulting in a superior type of wheel.

Our wheel engineers are at your service.

Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices: 208 South La Salle Street
Chicago, Illinois

GARY
WROUGHT STEEL WHEELS

Smooth starting . . . rapid pickups . . . quiet operation . . . power savings . . . riding comfort . . . when car journals are equipped with . . .

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

The operating economies and better riding qualities made possible by the application of Hyatts are well known to many city and interurban car companies through actual service.

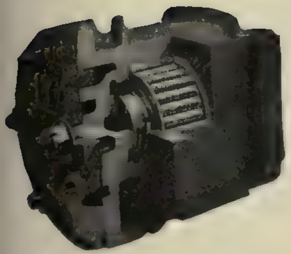
Hundreds of Hyatt equipped cars in various parts of the country today are evidence of Hyatt acceptance and faithful performance.

To those who may not be acquainted with Hyatt contributions to increased public good will and patronage, we welcome the opportunity of presenting facts and figures on anti-friction bearing journals.

The changeover to existing equipment, or their adoption to new cars, is made easy through Hyatt conformance to A. E. R. A. standards.

From whatever angle you look at it, the Hyattway is the Saving Way . . . the Right Way.

HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland



Hyatt Roller Bearing Journal Boxes fit A. E. R. A. pedestals, size for size. Existing equipment can be modernized by their adoption just as easily as they are applied to new equipment.

The Preferred Truck and Bus Rim of the Future–

Goodyear Type "K" Rim

BECAUSE the Goodyear Type "K" Rim is mechanically right, strong, light, and easy to operate, the truck user prefers them. Bus and truck manufacturers are rapidly adopting the Type "K" Rim.

Fleet owners find these rims a real economy because they provide a quick, easy tire change —cool running—minimum weight with truck rim strength at no extra cost.

The 18° single bevel mounting gives a rim that will stay tight on the wheel whether mounted as singles or duals. This exclusive feature, together with the amazingly easy tire application and removal regardless of the size of the tire or how badly the tire may be rusted to the rim, makes Goodyear Type "K" Rims popular with "the man who changes the tires."

Modernizing solid-tire-equipped trucks is conveniently and economically accomplished through the use of Goodyear Type "K" single or dual felloe equipment, or Type "K" spider wheel equipment which fits the same hubs as Budd disc wheels.

Type "K" Rim, felloe and spider wheel equipment available through Rim Distributors throughout the country.

Write today to Akron, Ohio, or Los Angeles, California, for detailed information. Goodyear offers truck and bus manufacturers the fullest co-operation of its engineering staff.

GOODYEAR

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Type "K" Truck & Bus Rim Equipment

288 more"
NEWARK
108 NEWARK NEW YORK

Another *big order,* another *repeat* order, the *10th repeat order* has been placed by America's largest Coach operator for

288 more

YELLOW COACHES

PUBLIC SERVICE
NJ

YELLOW COACH

Public Service
Co-ordinated Transport

Interesting Facts About Public Service

Total Buses Owned, Over 2000

Yellow Coaches Owned, 1203

Miles Operated, 64,000,000

Passengers Carried, 400,000,000

Miles of Bus Route, Over 1500

Number of Operating Garages, 33

Municipalities Served, Over 300

FIVE years ago, in January, 1924, the Public Service Co-ordinated Transport owned and were operating in the city of Newark, N. J., a total of 27 motor coaches.

Today this same company ranks first in America in number of coaches owned, in number of coach miles operated, in number of passengers carried, and its system of motor coach transportation now covers the greater part of the State of New Jersey.

Public Service Co-ordinated Transport is by far the largest bus operation in this country, and one of the most successful.

If the real inside history of the successful bus operating experience of this company could be written, it would begin with the story of a progressive management that foresaw the great economies that could be effected through co-ordination and standardization, and were not lacking in the necessary courage and perseverance to achieve their ideals.

The economic results made possible by the adoption of this far-sighted policy is now conspicuously apparent.

The reduction in operating and maintenance costs effected through the standardization of operating equipment, supplemented by a well-planned system of co-ordinated operation, and of decentralized service, has dramatically confirmed the soundness of the early forecasts made for it.

And when a company is operating 60 million miles a year, a material saving on each mile operated quickly runs into worthwhile figures.

That this progressive company should now be operating over 10 million dollars' worth of Yellow equipment is no mere coincidence.

That there were sound dollars and cents reasons, based on progressive operating-cost experience, that influenced the placing of each of the eleven successive orders for Yellow equipment, is equally obvious.

The first order for Yellow equipment, placed in January, 1924, was for 2 coaches. The next order was for 24. The next for 50. Then came an order in December, 1925, for 333—the largest single coach order ever placed, although in January, 1928, an order was placed for 331.

Each year more and more Yellow equipment has been added. The last order just placed for 288 Gas-Mechanical and Gas-Electric Yellow Coaches brings the grand total of Yellow Coaches owned to over 1200.

And of this number not one Yellow Coach has been withdrawn from active service.

It is with honest pride that we again repeat—

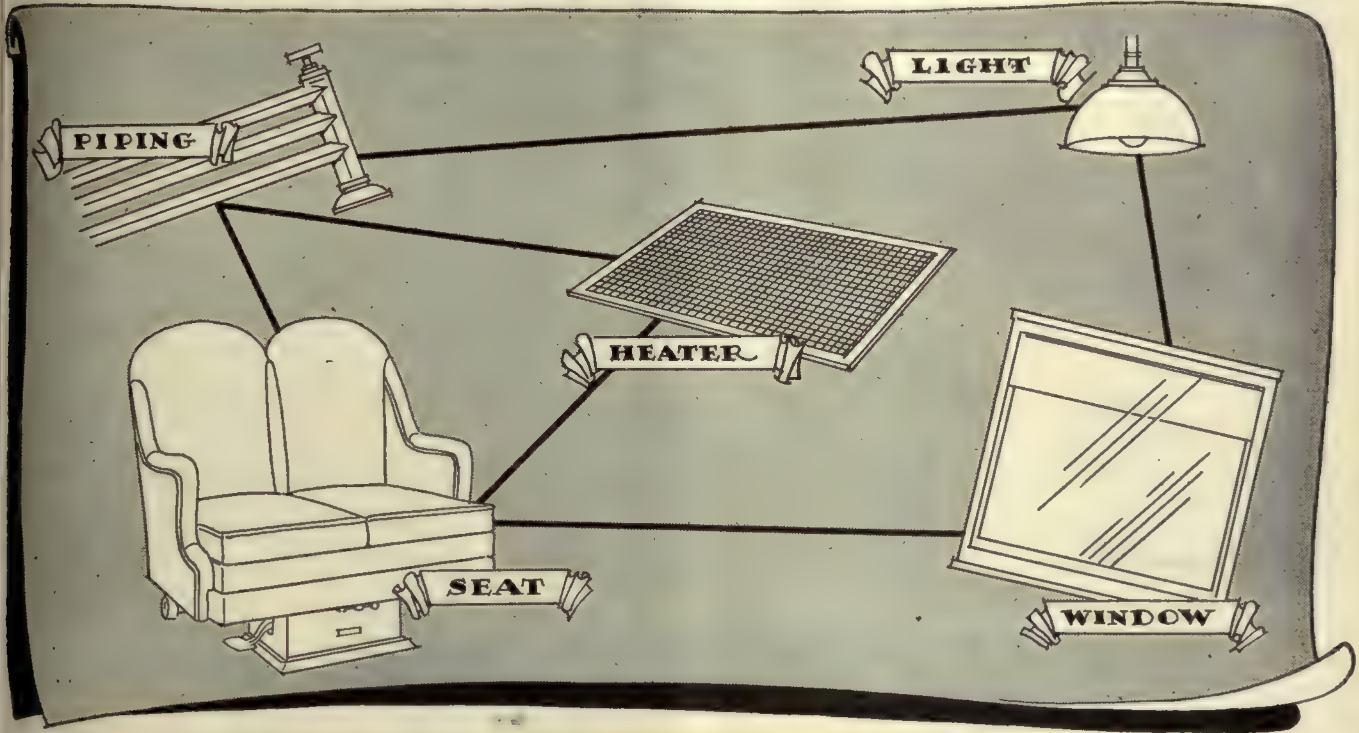
"Salesmanship may play a part in the initial purchase—but repeat orders are placed on the strength of performance and knowledge gained by experience."

The last order for 288 Yellow Coaches brings the grand total of Yellow equipment owned and operated by Public Service Co-ordinated Transport to over 1200, *and of this fleet not one Yellow Coach has been withdrawn from active service.*

YELLOW COACHES

General Motors Truck Company, Pontiac, Michigan

A PROBLEM in SEATING



Bring these factors properly together

A STREET railway car is primarily designed for movement but an equally important purpose is to seat your passengers and seat them *comfortably.* When the trucks and motors have been taken care of, therefore, the important issue becomes a problem of seats and seat arrangement. If the car is built without this consideration, the seats must be fitted in somewhat as an afterthought. They must be accommodated *to the car* and they cannot, in this way, be arranged for greatest comfort and convenience.

A Hale & Kilburn seating engineer can, therefore, render his most valuable service if called in while the car is still but a project in mind. He can, at this time, consider not only the arrangement of the seats with respect to spacing but in relation to the windows, lights and heaters, mode of boarding and alighting and all other comfort and convenience factors in the car.

If, in other words, these comfort and convenience factors are brought into proper relation at the very outset, the car can be built to *accommodate* such an arrangement rather than the seats arranged, as best they can be, to accommodate the car. The completed car thus best fulfills its most important function—that of pleasing and attracting riders.

HALE & KILBURN SEATS

"A Better Seat for Every Type of Modern Transportation Service"

HALE & KILBURN COMPANY

General Offices and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES:

Hale & Kilburn Co., Graybar Bldg., New York
Hale & Kilburn Co., McCormick Bldg., Chicago
E. A. Thornwell, Candler Bldg., Atlanta
Frank F. Bodler, 903 Monadnock Bldg., San Francisco
T. C. Coleman & Son, Starks Bldg., Louisville
W. L. Jefferies, Jr., Mutual Bldg., Richmond
W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 146 N. Sixth St., Portland, Oregon
C. S. Wright Co., 66 Temperance St., Toronto, Ont., Canada

HAMAN
& COMPANY
CARS STOP HERE
NO PARKING
ELECTRIC RAILWAY SERVICE AND COLLIER SERVICE BRING THE BUYERS TO MARKET
Car Card Advertising Almost Everywhere!

BARRON G. COLLIER
INC.
NEW YORK CITY

These TIES

Answer Yes!

Does it pay to use steel ties in track construction? The Carnegie Steel Cross Ties pictured above are old enough to vote and will add their voice to the affirmative. In 1907 they were laid in the tracks of the Chicago Surface Lines. Recently uncovered, it was decided to rerail the ties inasmuch as they were in such splendid condition. Twenty-two years of service and still going strong!

Yes! It pays to use Carnegie Steel Cross Ties. Nor is long service their only dividend. They provide a track that is free from interruptions for track repairs—a smooth track on which your passengers ride swiftly, safely and comfortably. Passenger appeal starts with the track. A poor track not only offsets the advantages of luxurious rolling equipment, but hastens it to a premature discard. In your 1929 track construction program, plan to include Carnegie Steel Cross Ties—an investment that pays dividends.

Booklet on Request.

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION

CARNEGIE BUILDING—PITTSBURGH, PA.

1955

He is your business partner

He considers first and foremost your interests.

He is truthful and honest in his dealings with you.

He is not provincial, but his experience is nation-wide in scope.

He is not opinionated, but brings to you unbiased facts, news, and reports.

He has a finger on the pulse of your trade's activities. He promulgates helpful information.

He is in close touch with manufacturers, producers, distributors—those from whom you buy.

He deals with none which has a tendency to mislead or which does not conform to business integrity.

He is a consultant that "sits in" with you regularly. His suggestions are profitable to you.

He holds a fellowship in a select association with exacting standards of membership.

He has pledged himself to determine the highest and largest function of the trade which he serves, and to strive in every legitimate way to promote that function.

HE IS THIS PAPER.

Your paper. A member of the Associated Business Papers, Inc.

A.B.P.

THE ASSOCIATED BUSINESS PAPERS, Inc.
Executive Offices: 52 Vanderbilt Avenue, New York, N.Y.

The A.B.P. comprises a group of business papers that reaches 54 fields of trade and industry. Membership requires the highest standards in every department of publishing, circulation, editorial, and advertising.

The advertisers in this publication demonstrate by their presence here that they are awake to modern methods of selling as well as production—methods that cut costs and standardize operations.

What Price Lubrication?

Between theoretically perfect lubrication and the average lies a wide field paved with wasted dollars.

Texaco Lubrication Service saves these dollars.

In industrial plants of all kinds throughout the world, in the land transportation systems, in marine service and in the great mining plants of the world, Texaco engineers are daily opening the way to better lubrication.

For The Texas Company is a great "complete cycle" organization. It manufactures a Texaco lubricant for every purpose. It owns and operates its own wells, pipe lines, refineries, manufacturing plants and transportation facilities. It is a company that provides a complete lubrication service.

Texaco lubrication engineers are specialists—retained to cooperate with you—to study your every requirement and specify exactly the proper lubricant in every case.

And wherever you are, no matter how great the range of your operations, this service, and the same uniformly high quality lubricants are always freely available.

TEXACO LUBRICANTS

THE TEXAS COMPANY
17 Battery Place, New York City
Offices in Principal Cities

THERE IS A TEXACO LUBRICANT FOR EVERY PURPOSE

SHRIMATI

If the Crim loses a boy or two through an epidemic, when the next boy is born he is given a shrimati, or girl's name; his hair is never cut and he may have to wear girl's clothes to fool the jinx.

Funny the extent to which our own people go in trying to make externals fool people as to the real internals.

Notice the sales of lipsticks and rouge mounting in the vain attempt to make the face of the girl look like nature's masterpiece.

Notice the sales of dressings and lubricants mounting in the vain attempt to make the face of the commutator look like one having the natural healthy gloss made by Morganite brushes.

And since the subject of brushes has come up, let us state that the true makeup of Morganite brushes is exposed by the link number on the brush.

Morganite Brush Co., Inc.

Main Office and Factory
3302-3320 Anable Ave., Long Island City, N. Y.

DISTRICT ENGINEERS AND AGENTS

Pittsburgh, Electrical Engineering & Mfg. Co., 909 Penn Ave.
Cleveland, Electrical Engineering & Mfg. Co., 320 Union Building.
Baltimore, O. T. Hall, Sales Engineer, 432 North Calvert St.
Revere, Mass., J. F. Drummey, 62 Pleasant Street.
Los Angeles, Electrical Engineering Sales Co., 502 Delta Bldg.
San Francisco, Electrical Engineering Sales Co., 222 Underwood Bldg.
Toronto, Can., Railway & Power Engineering Corp., Ltd., 133 Eastern Ave.
Montreal, Can., Railway & Power Engineering Corp., Ltd., 898 St. Antoine St.
Winnipeg, Can., Railway & Power Engineering Corp., Ltd., P. O. Box 325.

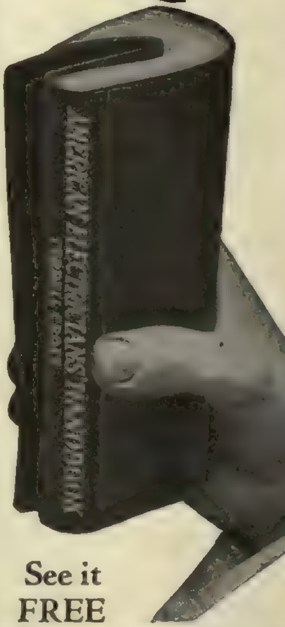
That electrical fact you want

—is here

For every man in electrical work

This is the one standard electrical help containing all the data, kinks, short-cuts, helps and other information that the practical electrician, wireman, lineman, contractor, plant superintendent and construction engineer needs.

Croft's
American Electricians' Handbook
By TERRELL CROFT
823 pages, flexible, pocket size, 900 illustrations, $4.00 net, postpaid



The book is brimful of those facts which every man engaged in electrical work needs to know.

Think how much help you would be able to get from a convenient pocket-size handbook that gives you in one book—

Practical suggestions for locating and correcting both motor and generator troubles—

Clear directions for proper installation and operation of motors and generators—

Explanations of fundamentals of practical electricity—

Helpful data on transformers—

All the details the practical man needs on wiring for light and power.

All these topics and many more are covered in this revised second edition of Croft's Handbook.

See it FREE

Make 1928 pay you— Mail this coupon now!

McGRAW-HILL FREE EXAMINATION COUPON

McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York.

Send me Croft's American Electricians' Handbook. $4.00 net, postpaid, on 10 days' approval. I agree to pay for the book or return it postpaid within 10 days of receipt.

(To secure book on approval print your name plainly and fill in all lines.)

Name ....
Home Address ....
Position ....
Name of Company ....

(Books sent on approval to retail purchasers in the U. S. and Canada only.) F. E.R.J.

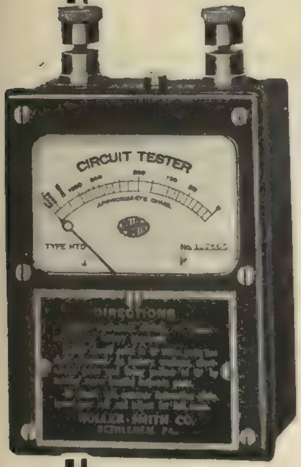
Bates-Truss Poles for Trolley Suspension

MODERN transportation demands modern methods. The Bates-Truss Pole is the solution of trolley suspension problems. The general tendency of electric railways toward the increased use of Bates-Truss Poles is significant in these days of high costs and keen transportation competition.

Structural simplicity, combined with lasting strength and fine appearance, makes the Bates-Truss Pole ideal for all forms of overhead construction. Let us quote you on poles, structures or towers.

Bates Expanded Steel Truss Co.
EAST CHICAGO, IND.

The Portable Direct Reading
TYPE HTD CIRCUIT TESTER



Here is an instrument built to meet the growing demand for a small, lightweight, inexpensive tester in railway repair shops, out on the line, in substations, etc.

For a compact, rugged and thoroughly dependable tester you will find the HTD Circuit Tester unexcelled. With it one can instantly locate open circuits in coils and circuits of all kinds. Not only that but it shows directly the approximate resistance of the coil or circuit up to a range of 10,000 ohms. Bulletin No. G-300 describes it.

Bulletin G-300 describes also the ROLLER-SMITH Type COM Ohmmeter which is portable, accurate and self-contained.

Bond Testers

ROLLER-SMITH Bond Testers are known and used all over the world. The Type SBT is recommended for all ordinary work and the super-sensitive Type BBT for conditions where there is little or no current in the rail. Bulletin G-200 should be in the hands of every man who is interested in bond testing.

Over 30 years' experience is back of ROLLER-SMITH

ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus

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2140 Woolworth Bldg., NEW YORK

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Bethlehem, Penna.

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Examinations Reports Appraisals
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Steam and Hydro-Electric Power Plants, Gas Plants,
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THE BEELER ORGANIZATION
Transportation, Traffic, Operating Surveys
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52 Vanderbilt Ave. New York

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Consulting Engineers
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Studies on Financial and Physical Rehabilitation
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683 Atlantic Ave., BOSTON, MASS.

STEVENS & WOOD
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Engineers and Constructors
20 Pine Street, New York
Transportation Examinations and Reports

WALTER JACKSON
Consultant on Fares and Motor Buses
The Weekly and Sunday Pass—Differential Fares—Ride Selling
Holbrook Hall 5-W-3,
472 Gramatan Ave., Mt. Vernon, N. Y.

McCLELLAN & JUNKERSFELD
Incorporated
ENGINEERING AND CONSTRUCTION
Examinations—Reports—Valuations
Transportation Problems—Power Developments
68 TRINITY PLACE NEW YORK

J. ROWLAND BIBBINS
CONSULTING ENGINEER — TRANSPORTATION
Organized Transit Development and Traffic Controls.
Economic Operation, Routing, Schedule Analyses.
Valuations, Rate Cases and Ordinances
EXPERIENCE IN 25 CITIES
2301 Connecticut Avenue Washington, D. C.

THE P. EDWARD WISH SERVICE
50 Church St. NEW YORK
Street Railway Inspection
DETECTIVES
131 State St. BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.

Boyerized Parts:

Brake Pins
Brake Hangers
Brake Levers
Pedestal Gibs
Brake Fulcrums
Turnbuckles
Case Hardened Bushings
Center Bearings
Side Bearings
Spring Post Bushings
Spring Posts
Bolster and Transom Chafing Plates
Manganese Brake Heads
Manganese Truck Parts
Forgings
Bronze Bearings
McArthur Turnbuckles
Trolley Pins

Can be purchased through the following representatives:

F F. Bodler,
903 Monadnock Bldg., San Francisco, Cal.

W. F. McKenney,
54 First Street, Portland, Oregon.

J. H. Denton,
1328 Broadway, New York City, N. Y.

A. W. Arlin,
519 Delta Bldg., Los Angeles, Cal.

Bemis Car Truck Company
Springfield, Mass.

Wharton Trackwork

of

Solid Tisco Manganese Steel

Keyed-centre Construction—with Tisco Manganese Steel Inserts

Nickel Chrome Construction

Special Constructions for Subway and Elevated Lines

WM. WHARTON JR. & CO., INC.
EASTON, PENNA.

Bethlehem Products for Electric Railways

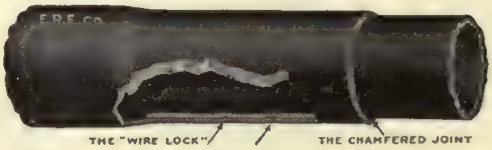
Tee and Girder Rails; Machine Fitted Joints; Splice Bars; Hard Center Frogs; Hard Center Mates; Rolled Alloy Steel Crossings; Abbott and Center Rib Base Plates; Rolled Steel Wheels and Forged Axles; Tie Rods; Bolts; Tie Plates and Pole Line Material.

Catalog Sent on Request

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

BETHLEHEM

ELRECO TUBULAR POLES

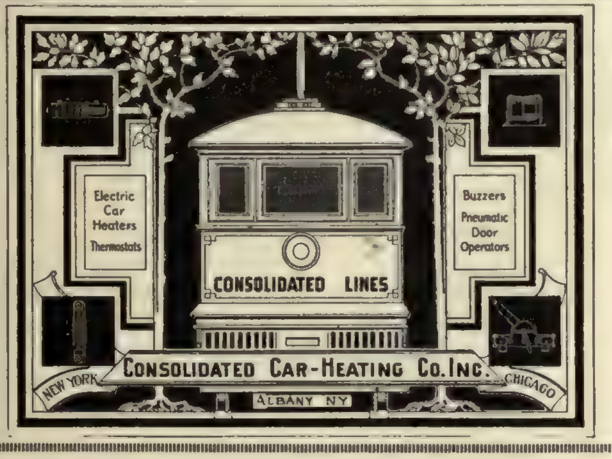


COMBINE

Lowest Cost
Least Maintenance
Lightest Weight
Greatest Adaptability

Catalog complete with engineering data sent on request.

ELECTRIC RAILWAY EQUIPMENT CO.
CINCINNATI, OHIO
New York City, 30 Church Street


Electric Car Heaters Thermostats
Buzzers Pneumatic Door Operators
CONSOLIDATED LINES
CONSOLIDATED CAR-HEATING CO. INC.
NEW YORK
ALBANY NY
CHICAGO

The Ideal Insulation for Electric Railways

INSULATED WIRES and CABLES
OKONITE, MANSON and DUNDEE TAPES

POWER CABLES, SIGNAL CABLES and CAR WIRING

THE OKONITE COMPANY

THE OKONITE-CALLENDER CABLE CO., INC.,
Factories: Passaic, N. J. Paterson, N. J.

Sales Offices: New York, Chicago, Pittsburgh, St. Louis, Boston, Atlanta, Birmingham, San Francisco, Los Angeles, Seattle, Dallas.

OKONITE

Okonite Quality Standards Unchanged for Half a Century

FARE

BOXES for BUSES

Let us tell you of this especially designed box for this class of service.

The Cleveland Fare Box Co.
4900 Lexington Ave., Cleveland, O.

Canadian Cleveland Fare Box Co., Ltd.
Preston, Ontario

COIN COUNTING AND SORTING MACHINES
CHANGE CARRIERS, TOKENS

The DIFFERENTIAL CAR

Standard on 60 Railways for

Track Maintenance
Track Construction
Ash Disposal
Coal Hauling
Concrete Materials
Waste Handling
Excavated Materials
Hauling Cross Ties
Snow Disposal

Use These Labor Savers

Differential Crane Car
Clark Concrete Breaker
Differential 3-way Auto Truck Body
Differential Car Wheel Truck and Tractor

THE DIFFERENTIAL STEEL CAR CO., Findlay, O.

LORAIN

Girder Rails, Special Trackwork, Switches, Frogs and Crossings in Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail

The Lorain Steel Company
SUBSIDIARY OF UNITED STATES STEEL CORPORATION
General Offices: Johnstown, Pennsylvania

Sales Offices:
Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh
Pacific Coast Distributors: United States Steel Products Co., San Francisco, Seattle, Portland, Los Angeles
Export Distributors: United States Steel Products Co., New York

COLUMBIA 18 92 MACHINE WORKS

COLUMBIA

Railway and Utility Supplies

Castings—Grey Iron, Brass and Aluminum

Forgings
Special Machinery and Patterns

Machine and Sheet Metal Work

Armature and Field Coils.

The Columbia Machine Works *and M. I. Co.*
265 Chestnut St., corner Atlantic Ave.,
Brooklyn, New York

Speedy cleaning accelerates repair work

WHETHER it's a rush job or regular repair work, you can cut down the time and labor needed by cleaning car parts the Oakite way.

Oakite materials and methods accelerate repair work by removing all the dirt and grime from metal parts in a fraction of the usual time. A short soaking in a hot solution of an Oakite material takes off every trace of oily film from parts, leaves them absolutely clean, easy for the shopmen to handle.

Write today for "Oakite in Railroad and Car Shops." It tells how to employ speedy, economical Oakite methods for every cleaning job.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Manufactured only by
OAKITE PRODUCTS, INC., 28B Thames St., NEW YORK

OAKITE
TRADE MARK REG. U. S. PAT. OFF.
Industrial Cleaning Materials and Methods

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches	$4.50 an inch
4 to 7 inches	4.30 an inch
8 to 14 inches	4.10 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

R.J.

POSITIONS WANTED

RESEARCH ENGINEER with technical training and background of railway experience, particularly fitting him to organize and co-ordinate your research and statistical activities, or head existing department. PW-166, Electric Railway Journal, Tenth Ave. at 36th St., New York.

SUPERINTENDENT transportation, broad experience, established successful record city, interurban railways, buses. Will accept position of assistant with future. Salary and location secondary importance. Fine references. PW-162, Electric Railway Journal, Tenth Ave. at 36th St., New York.

POSITION VACANT

MANAGER

Experienced street railway man wanted on eastern property operating 75 cars. Must be familiar with all phases of street railway work and successful in public relations. Technical education desirable. Good opportunity for advancement. Apply giving details and references. State salary expected.

PV-163, Electric Railway Journal
Tenth Ave. at 36th St., New York City.

OFFICIAL PROPOSAL

Bids: March 22.

Signal System

New York, N. Y.

Notice is hereby given that a public hearing will be held at the Office of the Board of Transportation of the City of New York, at No. 49 Lafayette Street, Borough of Manhattan, on the 22nd day of March, 1929, at 11:30 a.m., on the proposed terms and conditions of the draft form of contract for furnishing and installing signal and interlocking equipment on New York City's New Subway System, along Church Street, Sixth Avenue Extension, Central Park West, 8th Avenue, St. Nicholas Avenue, Broadway, Fort Washington Avenue and Broadway, and 207th Street, from Vesey Street to 207th Street, including the 207th Street Yard, at the Harlem River, in the Borough of Manhattan, City of New York.

Copies of said draft of proposed contract may be obtained at the Office of the Board of Transportation, at One Dollar each.

JOHN H. DELANEY,
Chairman.

FRANCIS J. SINNOTT,
Secretary.

March 5, 1929.

FOR SALE

Center Entrance Trailers

5—Kuhlman Car Co., mounted on Brill 67-F trucks with 24-in. steel wheels; equipped with G. E. air brakes. Seating capacity 58. Length over-all 47 ft. Very good condition. Low price for quick sale.

Erie Railways Co., 231 State St., Erie, Pa.

FOR SALE

D. C.—550 Volt Units

1—Hamilton Corliss Cross Compound Engine, size 20x40x42 in. direct connected to Crocker-Wheeler Generator—400 kw., 728 amp. Has an extra new Armature mounted on shaft that has never been used. Complete with self-feed, oiling and filtering system.
1—Deane Vacuum Pump 12x14x14x12.
1—Wheeler Condenser, surface type.
1—150 hp. Motor, 400 r.p.m.
1—130 hp. Motor, 340 r.p.m.
1—75 hp. Motor, 775 r.p.m.
2—60 hp. Motor, 1,200 r.p.m.
1—35 hp. Motor, 730 r.p.m.
1—25 hp. Motor, 665 r.p.m.
1—25 hp. Motor, 1,800 r.p.m.
1—20 hp. Motor, 925 r.p.m.
1—10 hp. Motor, 1,350 r.p.m.
1—7½ hp. Motor, 750 r.p.m.
4—5 hp. Motor, 1,300 r.p.m.
2—3 hp. Motor, 1,375 r.p.m.
1—3 hp. Motor, 2,100 r.p.m.
1—2 hp. Motor, 1,200 r.p.m.
2—1 hp. Motor, 1,375 r.p.m.

All motors now in service, but will be released in about 10 days. Can be inspected at Wedron, Ill.

Wedron Silica Company
38 So. Dearborn St., Chicago, Ill.

25,644

In one year alone, 25,644 advertisements were published in the Searchlight Sections of the McGraw-Hill Publications.

The thousands of orders received by the Searchlight Department every year have given us the experience necessary for handling *your* orders promptly and efficiently.

Write, Wire, 'Phone

SEARCHLIGHT DEPT.

Tenth Avenue at 36th St., New York

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Advertising, Streeet Car
Collier, Inc., Barron G.

Air Brakes
General Electric Co.
Westinghouse Tr. Br. Co.

Air Circuit Breakers
Roller-Smith Co.

Ammeters
Roller-Smith Co.

Anchors, Guy
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.

Automatic Regulators, Voltage, Current & Synchronizing
American Brown Boveri Electric Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Illinois Steel Co.
Westinghouse E. & M. Co.

Babbitting Devices
Columbia Machine Works

Badges and Buttons
Elec. Service Supplies Co.
International Reg. Co., The

Batteries, Dry
Nichols-Lintern Co.

Bearings, Anti-Friction
Hyatt Roller Bearing Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Cincinnati Car Co.
Columbia Machine Works
Stucki Co., A.

Bearings, Roller
Hyatt Roller Bearing Co.

Bells and Buzzers
Consolidated Car Htg. Co.

Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Elec. Service Supplies Co.

Benders, Rail
Railway Trackwork Co.

Bodies, Bus
Brill Co. The J. G.

Bolts, Case Hardened
American Steel Foundries
Bemis Car Truck Co.

Bolts and Nuts, Track
Illinois Steel Co.

Bond Testers
Electric Service Supplies Co.
Roller-Smith Co.

Bonding Apparatus
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Bonds, Rail
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Books
McGraw-Hill Book Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
Bates Expanded Steel Truss Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Brake Adjusters
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
American Brake Shoe & Found. Corp.
Bemis Car Truck Co.
Brill Co., The J. G.

Brake Testers
National Ry. Appliance Co.

Brakes, Brake Systems and Brake Parts
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
General Electric Co.
National Brake Co.
Safety Car Devices Co.
Westinghouse Tr. Br. Co.

Brakes, Magnetic Rail
Cincinnati Car Co.

Brushes, Carbon
General Electric Co.
Morganite Brush Co., Inc.
Westinghouse E. & M. Co.

Brushes, Graphite
Morganite Brush Co., Inc.

Brushholders
Columbia Machine Works
General Electric Co.

Buses
Twin Coach Corp.

Buses, Motor
General Electric Co.
General Motors Truck Co.

Bus Lighting
National Ry. Appliance Co.

Bushings, Case Hardened and Manganese
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works

Cables (See Wires and Cables)

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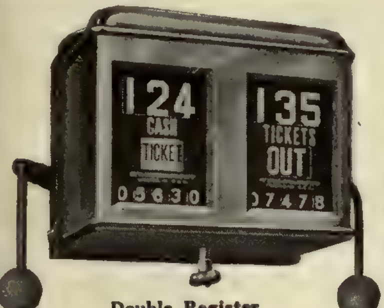
(Continued on page 44)



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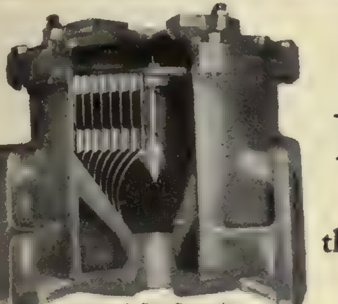

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(Continued on page 46)

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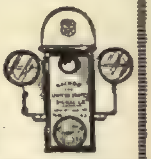

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Railway Trackwork Co.
Una Welding & Bonding Co.
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Una Welding & Bonding Co.
Westinghouse E. & M. Co.

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Roebling's Sons Co., J. A.

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Carnegie Steel Co.
Illinois Steel Co.
Standard Steel Works

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Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
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Carnegie Steel Co.
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Whistles, Air
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Economy Plus Rider Appeal

THE comparative light weight of Brill MASTER UNIT Cars effects a corresponding reduction in the cost of power. Furthermore, due to the uniformity of construction, fewer varieties of maintenance parts are required.

While these advantages in operating and maintenance costs are important, the equally important feature of attractive exterior and interior appearance has also been given careful attention. Pleasing lines, attractive color combinations, ample lighting facilities and comfortable seating equipment all play a part in attracting riders and convincing them of the advantages of the modern electric car as a transportation vehicle.

Consider the new series of Brill MASTER UNIT Cars from every point of view. We believe you will agree that they are unequalled business builders.

Watch for further announcements.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.
AMERICAN CAR CO. ST LOUIS MO — G. C. KUHLMAN CAR CO. CLEVELAND, OHIO — WASON MANF'G CO. SPRINGFIELD, MASS
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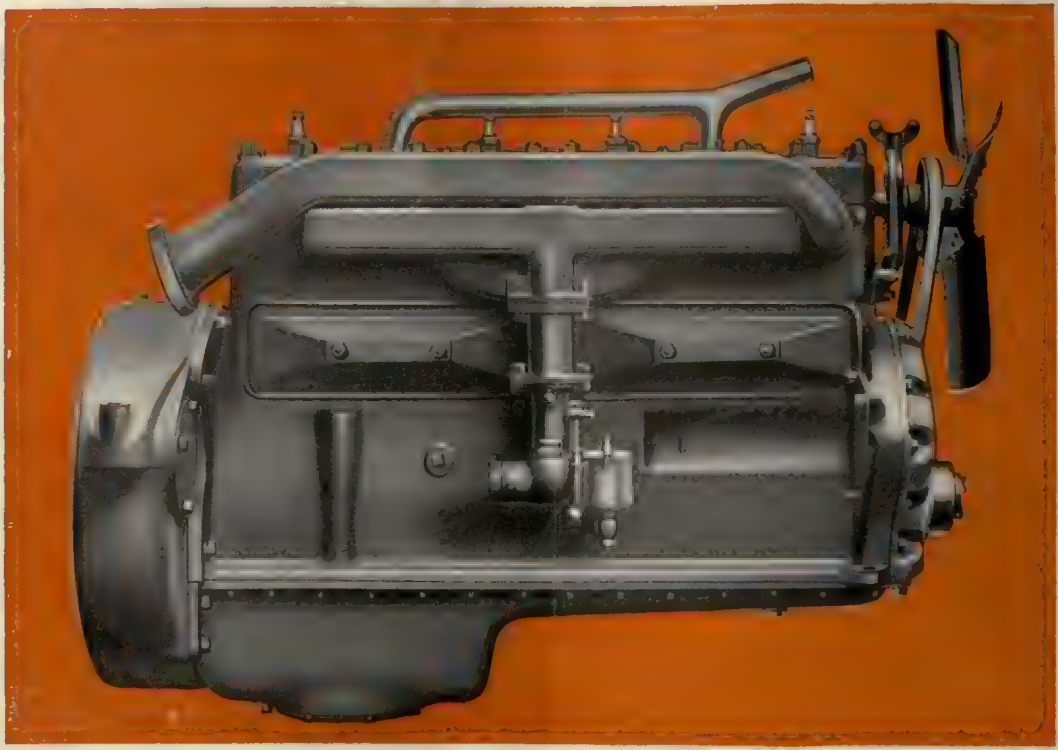
Brill MASTER UNIT Cars



Transport Six

Waukesha
Ricardo Head
L-HEAD ENGINES
THEY TAKE BETTER
CARE OF THEMSELVES

A Long Life Engine for Buses

Long life and durability under the stress of modern high-speed transportation requirements will be obtained with the Waukesha Transport Six. It is designed to handle both city and suburban buses with tough schedules.

Three-inch diameter seven bearing crankshaft, girder type crankcase, truncated cylinders, full-pressure filtered-oil lubricating system and fuel-saving Ricardo Head—these features insure long life and low cost of transportation.

AUTOMOTIVE EQUIPMENT DIVISION

WAUKESHA MOTOR COMPANY

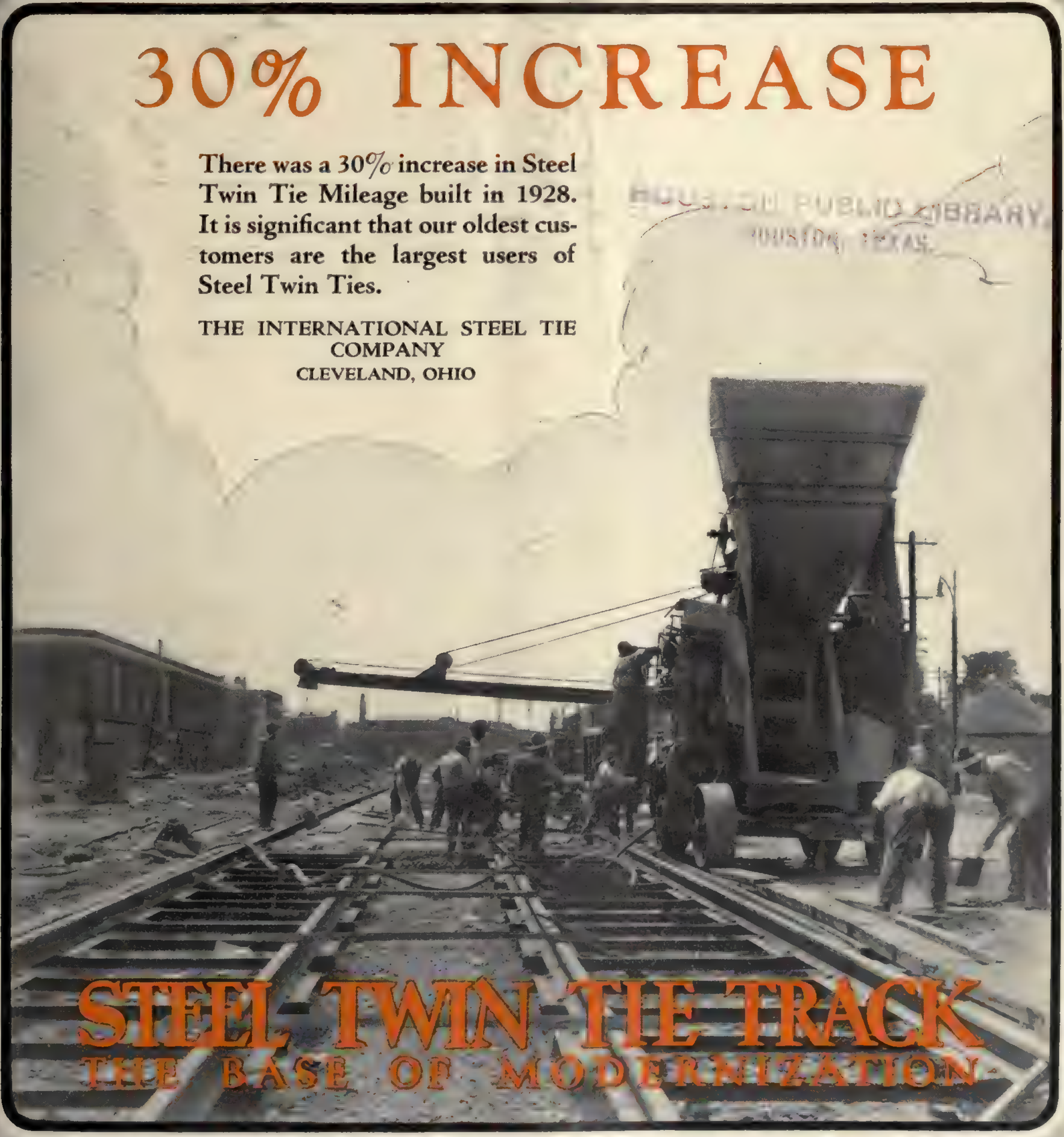
New York Office: 8 West 40th Street **Waukesha, Wisconsin** *San Francisco: 555 Howard Street*

Exclusive Builders of Heavy-Duty Internal Combustion Engines for Over Twenty Years

MAINTENANCE AND CONSTRUCTION ISSUE

ELECTRIC RAILWAY JOURNAL

Hill Publishing Company, Inc.
MARCH 16, 1929
Twenty Cents Per Copy



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There was a 30% increase in Steel Twin Tie Mileage built in 1928. It is significant that our oldest customers are the largest users of Steel Twin Ties.

THE INTERNATIONAL STEEL TIE COMPANY
CLEVELAND, OHIO

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A NEW AND BIGGER

Electric Railway Journal

TO BE ISSUED MONTHLY
IN COMBINATION WITH

Electric Railway Journal News

Issued each Saturday except in those weeks in which the monthly appears

DON'T MISS THE APRIL

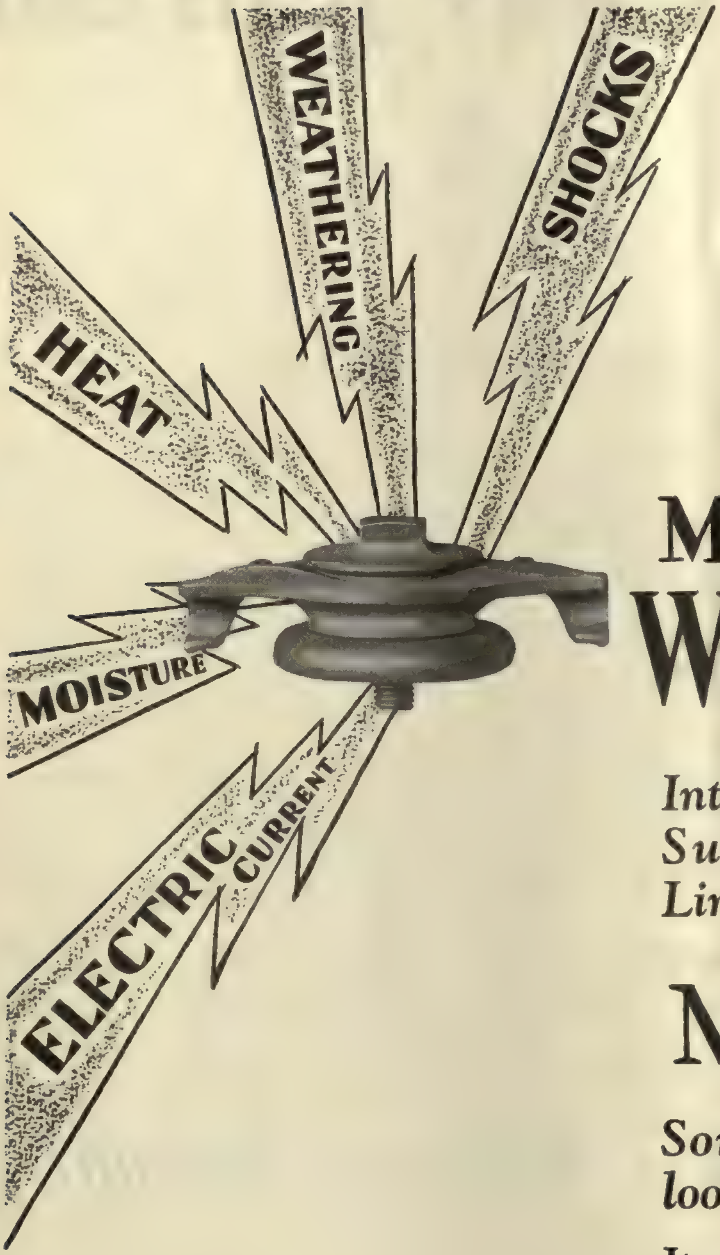
ANNUAL MAINTENANCE NUMBER

This will be the first issue of the new monthly. The April number will be packed with the most comprehensive survey of local transportation maintenance practices and methods ever published by the JOURNAL in a single issue.

Here is a PARTIAL *Outline*

A survey of new car experience—How Southern properties reduced equipment costs — Bus garage and shop design on 50 properties—Using track maintenance as a guide in design — Overhead line construction and maintenance — Use of light oil for journal lubrication—Methods of reducing car noise—Eight pages of maintenance "kinks" and short cuts.

Present domestic subscriptions at $4 per year for ELECTRIC RAILWAY JOURNAL may be applied to cover both the New Monthly and ELECTRIC RAILWAY JOURNAL NEWS. The subscription price of the New Monthly only (thirteen issues) is $3 per year. Present subscriptions will be extended on a dollar for dollar basis to apply to the monthly publication for those who do not elect to subscribe to ELECTRIC RAILWAY JOURNAL NEWS. The last issue of the publication in its present form will be the March 23 number next week.



This NEW Molded Material Withstands All

Introducing a New Molded Substance to Strengthen Line Material - -

Moldarta

Something you have been looking for.

It will not soften under intense heat
It will not absorb moisture
It will not change color
It is not fragile
It is very tough
It has high dielectric strength

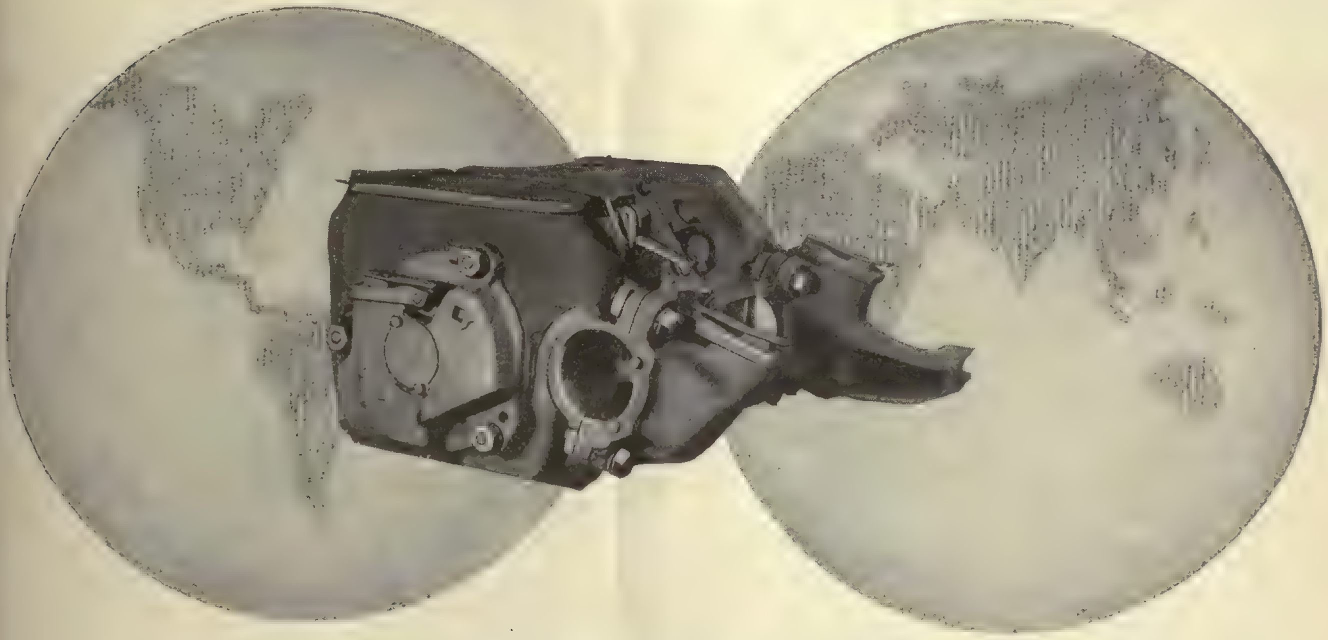
Westinghouse Electric & Manufacturing Co.
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries
T-30381

Westinghouse

Moldarta Suspension

7500 Type 510 Motors–

(35 Horsepower)



~are useful transportation servants the world over

THERE are 7500 Westinghouse Type 510, 35 horsepower motors powering more than 1900 modern electric street cars at the present time. Most of these cars are in congested city service where frequent stops and high accelerating rates are necessary.

Geographically, the operation of cars equipped with this dependable motor is distributed over numerous transportation arteries in cities throughout 23 states and in 6 countries abroad. Many of its users repeatedly have ordered this motor for their new cars.

The large number in service attests to the ability of the Type 510 motor to withstand the grind of difficult city service with reliable operation, high quality of performance and the minimum cost of upkeep.

The nearest Westinghouse representative will furnish reference to railway properties using the Type 510 motor in your territory, and detailed information about its construction and performance.

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

Where Type 510 Motors are used

United States

- Alabama
- Florida
- Hawaii
- Iowa
- Illinois
- Indiana
- Kansas
- Louisiana
- Maryland
- Massachusetts
- Michigan
- Missouri
- Nebraska
- New Jersey
- New York
- Ohio
- Pennsylvania
- South Carolina
- Texas
- Virginia
- Washington
- West Virginia
- Wisconsin

Abroad

- Canada
- Costa Rica
- Japan
- Mexico
- Newfoundland
- Spain

Westinghouse

30442

BETTER RAIL, BETTER TRANSPORTATION

"Saved thousands"

One road saved thousands of dollars in one year simply by abolishing the hand swabbing method of lubricating curves and substituting the R. T. W. Track Oiler.

Here's its portrait.

Details?

Railway Trackwork Co.
3132-48 East Thompson Street, Philadelphia

AGENTS:
Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston.
Electric Engineering & Mfg. Co., Pittsburgh
H. F. McDermott, 208 S. La Salle St., Chicago.
P. W. Wood Railway Supply Co., New Orleans, La.
Equipment & Engineering Co., London.
Frazar & Co., Japan.

3174

BETTER RAIL, BETTER TRANSPORTATION

Type B Armature Stand

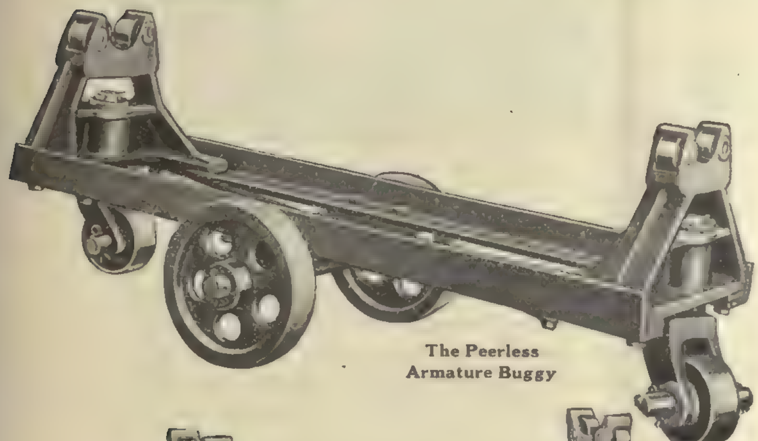
Do you realize the economies of these methods of handling armatures?

Armature handling by primitive, backbreaking methods isn't economy—it takes its toll in energy, damage to armatures and injuries to employees.

From our long experience in the field, we have evolved the simplest, fastest and most efficient methods of handling armatures. Here are three that will pay for themselves in short time:

1. The Peerless Type B Armature stand—two rugged steel adjustable supports with heavy circular bases. Adjustable for height while armature is in position. A table is attached which is convenient for tools when winding and as a seat when putting the leads in the commutator.
2. Peerless Type A armature winding stands consist of two cast iron standards mounted on angle steel sills, one standard permanently attached to the sill, the other being adjustable to various lengths of armatures. Substantial construction hinged shelves at each end for tools or as seat for operator, easy guiding rollers make the Peerless Type A a labor-saver around the shop.
3. The Peerless Armature Buggy—a strong, compact metal truck on easy-guiding pivoted castors, designed for quick, easy handling of armatures around the shops and in the hauls to the bake oven. Two 1¼-inch bronze rollers protect the armature shaft against damage.

All the details on this money-saving equipment on request.



The Peerless Armature Buggy

Type A Armature Winding Stand

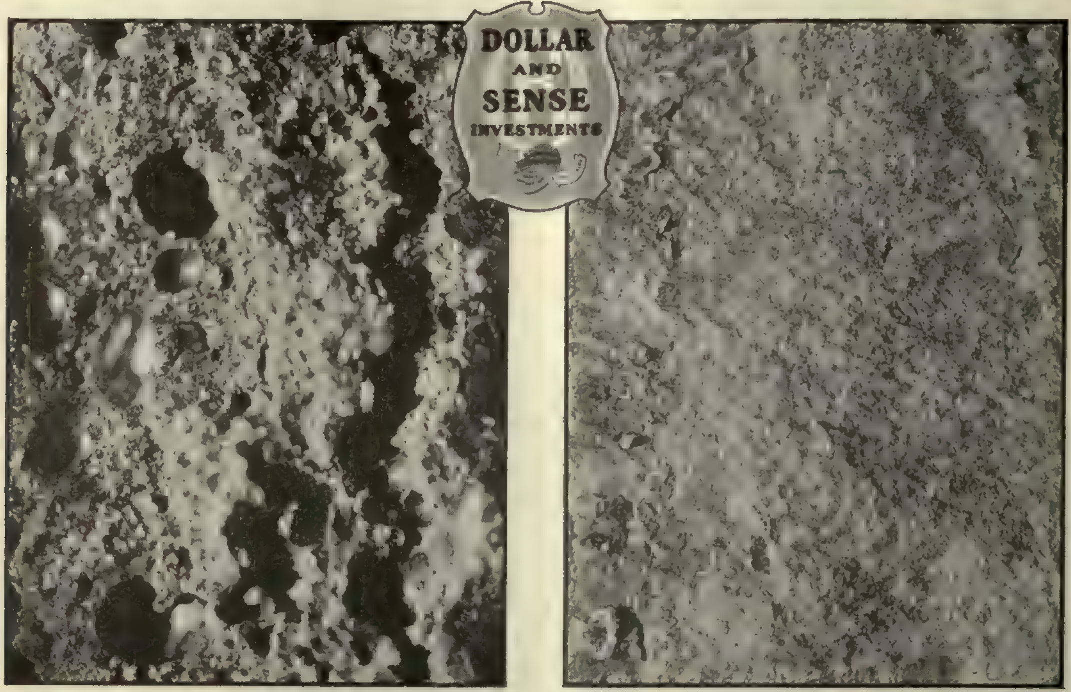
ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, New York City.

Branches—Bessemer Bldg., Pittsburgh; 88 Broad Street, Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

Factors that Improve



ONE important factor in long service life of rail bonds is proper bonding to the rail. A weld should make a compact, homogenous union with the rail. When it does this low resistance and permanence are assured. To make this possible O-B manufactures Duron Welding Rod—a silicon copper rod for electric arc welding of proved welding qualities.

To illustrate its distinct advantages over ordinary scrap copper wire for welding, two bonds, one welded with Duron Welding Rod and one with copper wire, were sheared from a rail and the sheared surface photomicrographed.

The appearance of the two welds, enlarged four diameters, is shown above. Obviously, the weld made with Duron Welding Rod, (shown at the right) with its fine texture and even union with the rail, will out-live the copper wire weld indefinitely.

This is a most important factor in bond performance. It indicates the important consideration you should give to Duron Welding Rod.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1011B

Ohio Brass Co.
NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ATLANTA CLEVELAND BOSTON SAN FRANCISCO LOS ANGELES

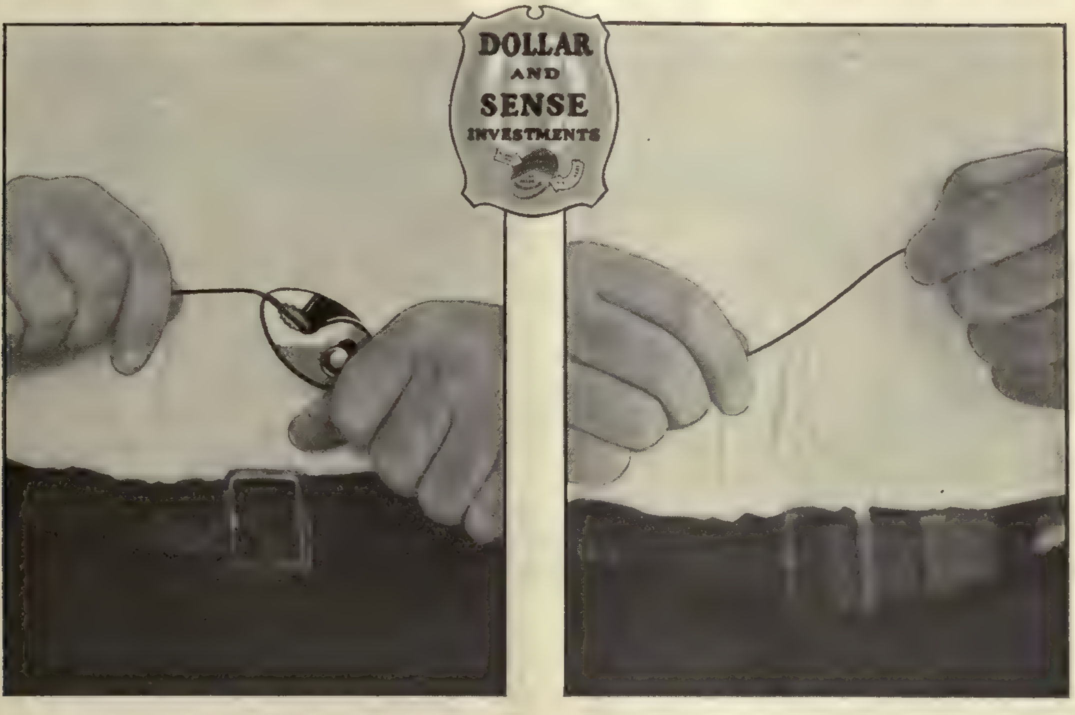
PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

O-B TITON Rail Bond for application to head of rail by copper-alloy Arc-welding process. Page 667, O-B Catalog No. 20.

Terminal of O-B Type AW-12 Rail Bond for application to base of rail by copper-alloy arc-welding process. Standard lengths up to 36 in. Page 670, O-B Catalog No. 20.

O-B Type AW-15 Rail Bond for application to base of rail by copper alloy-arc-welding process. Page 48, Supp. No. 2 to O-B Catalog No. 20.

Bond Performance



EQUALLY important to the long service life of O-B rail bonds is the *Internal Copper Sleeve*—used on all O-B rail bonds. This construction is directly responsible for the small percentage of strand breakage in O-B Bonds.

The illustrations above show why this is true. Hold a piece of wire in a pair of pliers. Bend it back and forth until it breaks. Then hold the wire between the thumb and finger and repeat the experiment. The latter method requires from three to four times as many bends, because of the cushioning effect of the thumb and finger.

The internal copper sleeves act in exactly the same manner, by forming a cushion about the cable and preventing direct contact with the rigid metal of the bond terminal; absorbing the friction and destructive action set up by the vibration of trains passing over the joint.

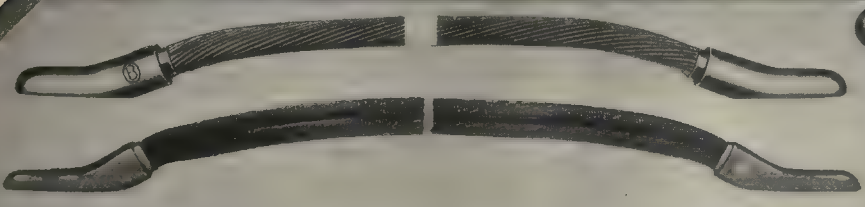
If you are not now obtaining the performance made possible by the Internal Copper Sleeve, you should investigate at once.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1011B

Ohio Brass Co.

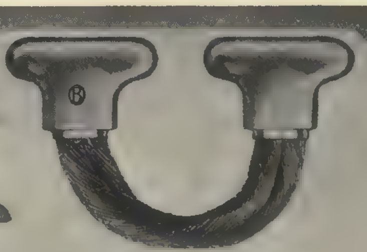
NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ATLANTA CLEVELAND BOSTON SAN FRANCISCO LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES



Above: O-B Type AW-7 Rail Bond for application to base of rail by steel arc-welding process. Standard lengths up to 36 in. Page 664, O-B Catalog No. 20.

Below: O-B Type AW-11 Rail Bond for application to base of rail, under splice plates, by steel arc-welding process. Standard lengths up to 36 inches. Page 669, O-B Catalog No. 20.



O-B Type AW-8 Rail Bond for application to head of rail by steel arc-welding process. Page 666, O-B Catalog No. 20.

Rough riding . . . . .

Some people don't mind it . . . A few actually seem to like it!

But the majority of us prefer a more comfortable conveyance. When it comes to local transportation we like it faster and smoother. And we're willing to patronize and pay the system that gives us what we want.

Rough riding railway track is distinctly out of date. The rubber-tired auto put it out. Regardless of the economic merits of new cars, the public won't ride on them if they're slow and rough riding.

Speed, with smooth-riding comfort, is obtainable only on perfectly straight, even-surfaced track. Only perfect joints will do—or better still, no joints at all.

And this means Thermit-welded, of course. Thermit-welded rail is the answer to the present day problem of suitable track for the modern car.

THERMIT

METAL & THERMIT CORPORATION
120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

the latest Recommendation from Cincinnati for Revenue Paying Transportation

a smaller Versare Uni
place in city

SEATING 33 or 35 passengers, having extremely fast acceleration (3 miles per hour per second up to 12 miles per hour), this four-wheel gas-electric coach fills a place long vacant in city transportation needs.

For outlying metropolitan service having a fluctuating load requiring maximum capacity in a small unit, or for maximum load requirements of smaller city properties, where traffic movement is always at a faster schedule speed than is possible in more heavily congested districts, this Versare Transportation unit *fits in!* Its quick pick-up insures extremely fast smooth starts, eliminating in the passenger's mind that impression of slowness, present in most coaches as other vehicles pass him. This one feature alone will be a means of retaining and increasing revenue riders.

All construction details are identical with other Versare Units, assuring the same absence of body and other maintenance costs.

which has a definite transportation Systems ~

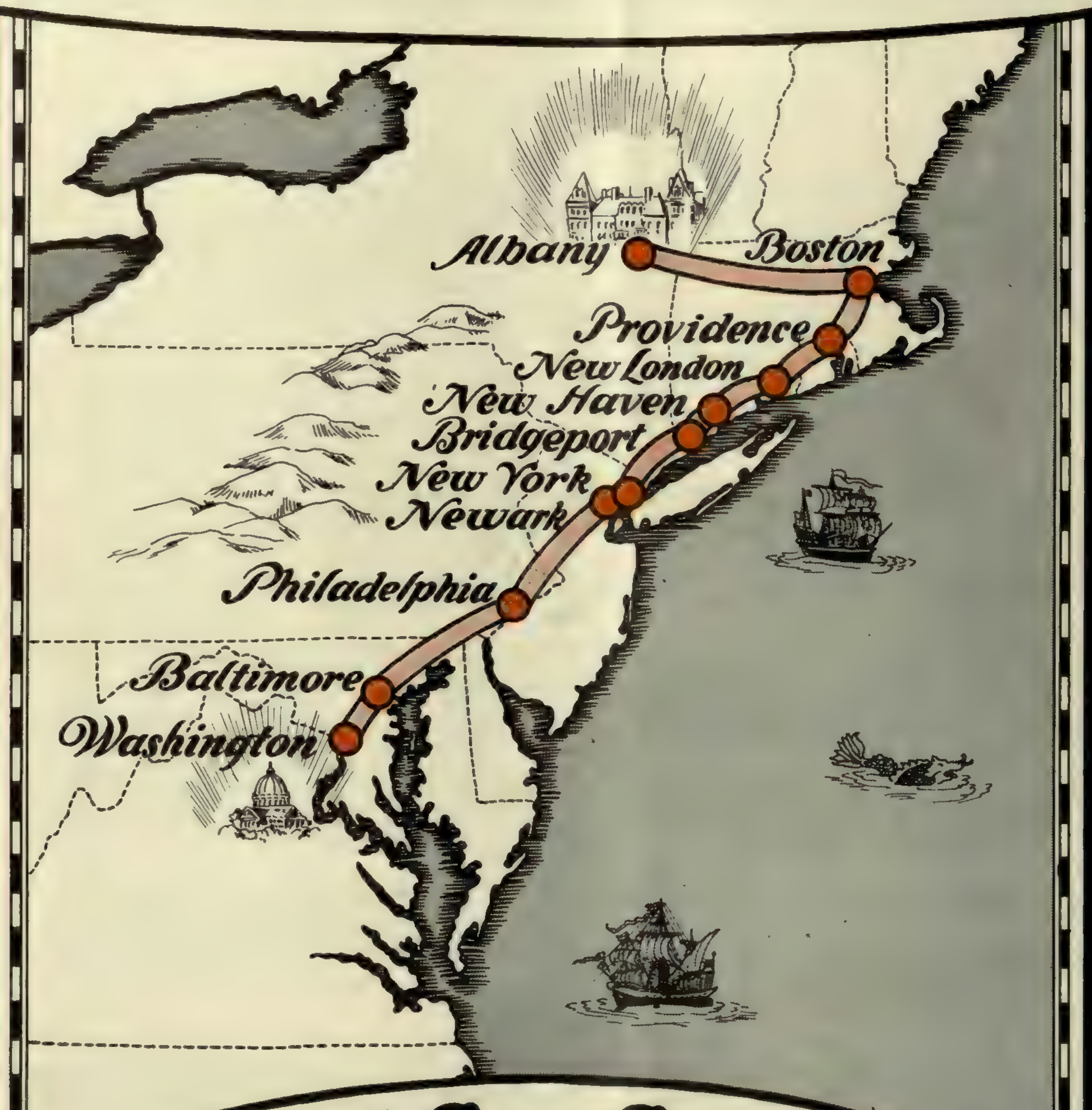
POINTS

1 —*Fastest and smoothest acceleration of any coach on the road, facilitating increased schedule speeds.*

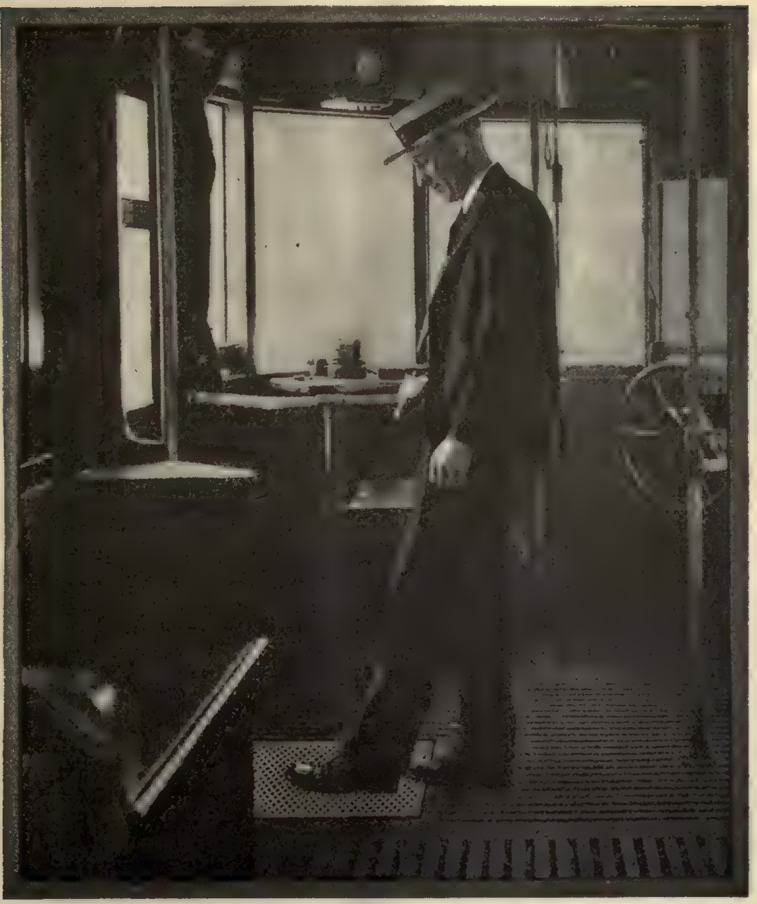
2 —*Unusual hill climbing ability: 15 miles per hour on 12% grade, fully loaded.*

3 —*Unusual accessibility of power unit from all sides.*

ONE of the Versare Coaches of this type started on route shown below. Another will start very shortly on a Western Tour. Special stops along the route may be arranged by a wire to the company.



Cincinnati Car Corporation
WINTON PLACE
CINCINNATI, OHIO



SELF SERVICE CARS

The National Pneumatic Treadle follows the modern trend inasmuch as it permits the rider to open the exit door for himself when the car has come to a full stop. Riders like it—operators benefit by it—it is the final word in modernization.

NP

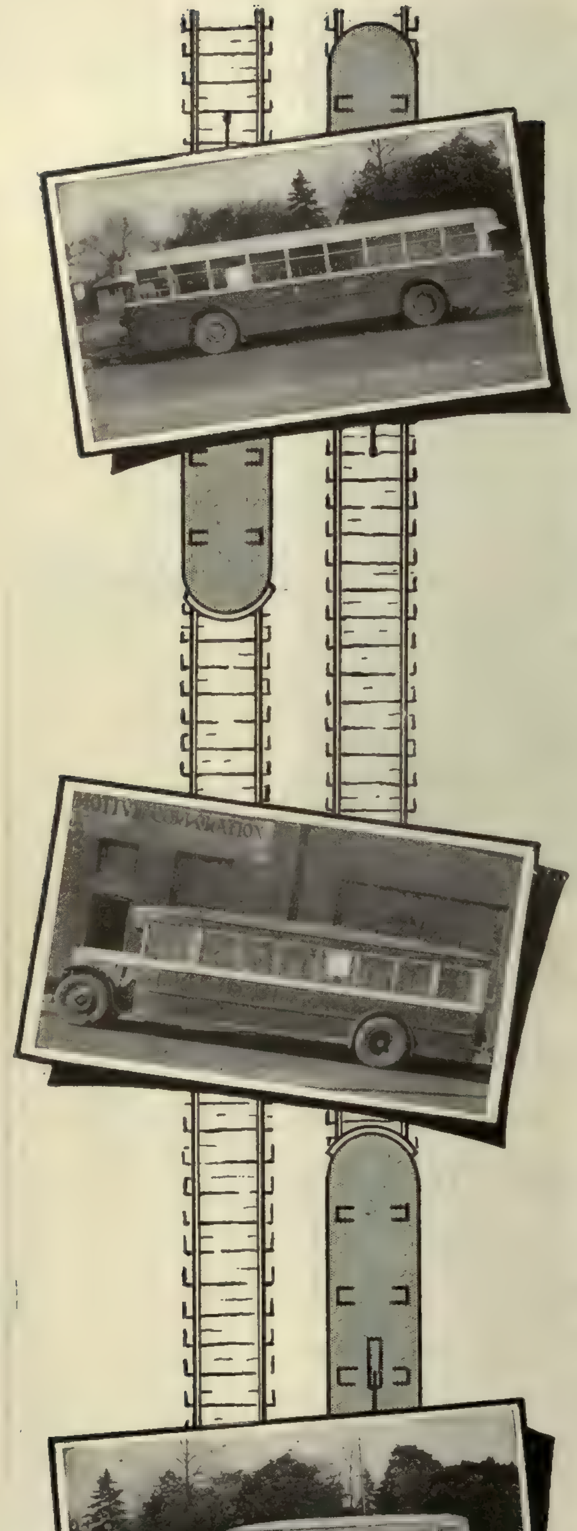
NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York
General Works, Rahway, New Jersey

CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building



AIR BRAKED BUSES ⸗ ⸗ ⸗ ⸗ *Improve* Coordinated Service ⸗ ⸗ ⸗

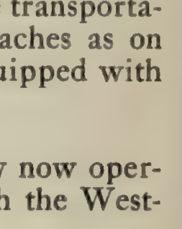
The Community Traction Company at Toledo, Ohio, is among the many street railway properties that are making great strides toward better service for their patrons by coordination of rail and highway transportation.

In addition to making improvements in the equipment and routing of street cars, this company is operating a number of buses—as feeder lines to new territory—for cross town service—and to supplant rail service on some routes where bus operation fits the case better.

The same degree of prompt and safe transportation is being realized on motor coaches as on rail cars by virtue of their being equipped with air brakes.

The Community Traction Company now operates 66 buses that are equipped with the Westinghouse Air Brake.

Leading automotive manufacturers are now equipping their standard line of commercial vehicles with the Westinghouse Air Brake—thus incorporating a factor that is reflected in maximum safety and earning capacity.



Westinghouse Traction Brake Company

Automotive Brake Division **Wilmerding, Pa.**

WESTINGHOUSE AUTOMOTIVE AIR BRAKES

◆◆ BEHIND THE PYRAMIDS—3 ◆◆

NCC

Purifying the pitch binder

General view of pitch plant

OUR modern stills for the purification of pitch binders are gas-fired, and are operated under close scientific control. During the distilling process the lighter hydrocarbons are boiled off, and condensed in great water-cooled condensers. The pitch is then distilled out under conditions that hold its characteristics within close limits. This leaves in the still a residue of ash and other materials unsuitable for brush manufacture. Laboratory tests check every step in the process, and prove the quality of the pitch before it is used.

This great care is necessary, even though the pitch is used solely as a binder, for were we to use an impure pitch the quality of our brushes would be affected. Ash, for instance, is most undesirable in a brush, and if our pitch contained ash, that ash would be found in the finished brush and interfere with the operation for which National Pyramid Brushes are famous. The pitch we use is so pure that it can be said to leave within the finished brush nothing but carbon. Our extra-extreme technical care in checking component parts in NCC Brushes insures exact performance. Because NCC Brushes are held to a close standard of manufacture they prove much more efficient in actual practice.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide UCC *and Carbon Corporation*

Carbon Sales Division

SILVER STRAND CABLE TRADE MARK REGISTERED

Cleveland, Ohio

Branch Offices and Factories

Jersey City Pittsburgh Chicago Birmingham San Francisco

With VARIOUS

Used with brick paving, at Terre Haute, Ind.

Used with concrete paving, at Richmond, Ind.

CAREY Elastite System of Track Insulation is a preformed asphaltic compound, reenforced with asphalt-saturated fibres. A moisture-proof, resilient rail-pavement cushion. Made to fit any rail section; easily installed, regardless of weather conditions.

THE PHILIP CAREY COMPANY,

types of paving

on the T. H. I. & E.

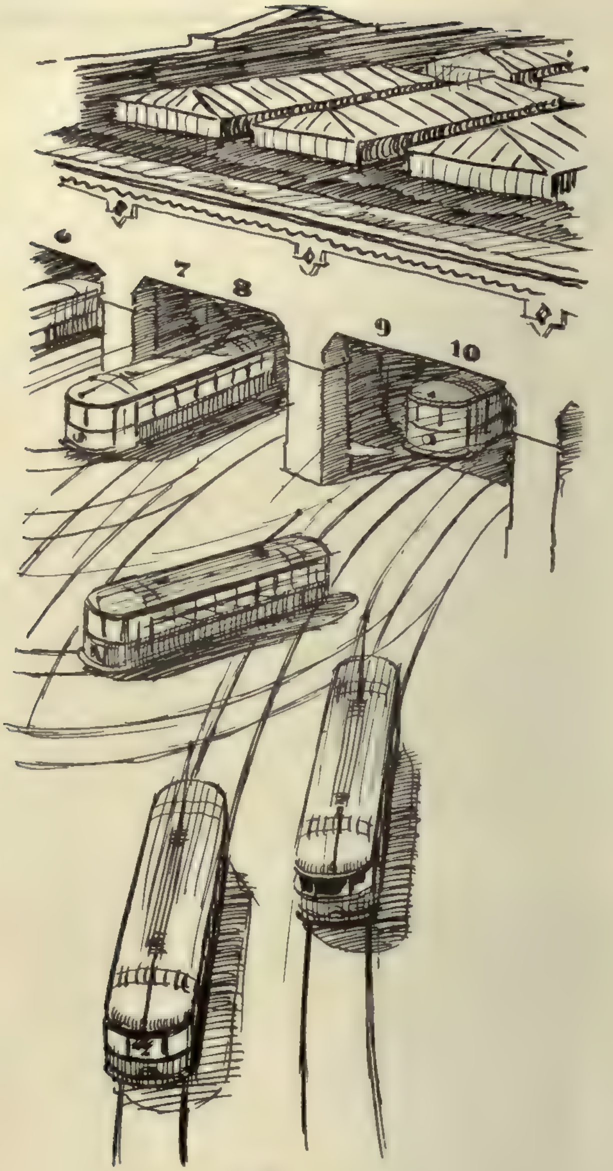
Since early in 1925, the THI&E Traction Company has used thousands of lineal feet of Carey Elastite System of Track Insulation on their lines through Indiana. For new construction, for repair work. With concrete, brick and asphalt paving—with T-rails. To minimize noise, to protect paving, to give patrons better service.

And what is true in the Hoosier State is true everywhere. Traction engineers in almost two hundred cities, large and small, are using and recommending this advanced system of track insulation. A really remarkable traction improvement! Of course, you will want all the facts.

Showing frog installation, at Terre Haute, Ind.

Carey Elastite
REG. U.S. PAT. OFF.
TRADE MARK REG. U.S. PATENT OFFICE
SYSTEM OF
TRACK INSULATION

Lockland, CINCINNATI, OHIO



On the regular car inspections—

How about **your** *wheels?*

When cars are checked at the barns, does the report tell of badly worn wheels, inaccurate shafts and axles? Or does the report read—"Wheels, Axles and Springs O.K.?"

"Standard" Wheels, Axles, Shafts and Springs are made of the stuff which checks "O.K."

Rolled Steel Wheels

Armature Shafts

Axles and Springs

"FOR EVERY TYPE OF CAR

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IN EVERY TYPE OF SERVICE"

STANDARD STEEL WORKS COMPANY

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CHICAGO
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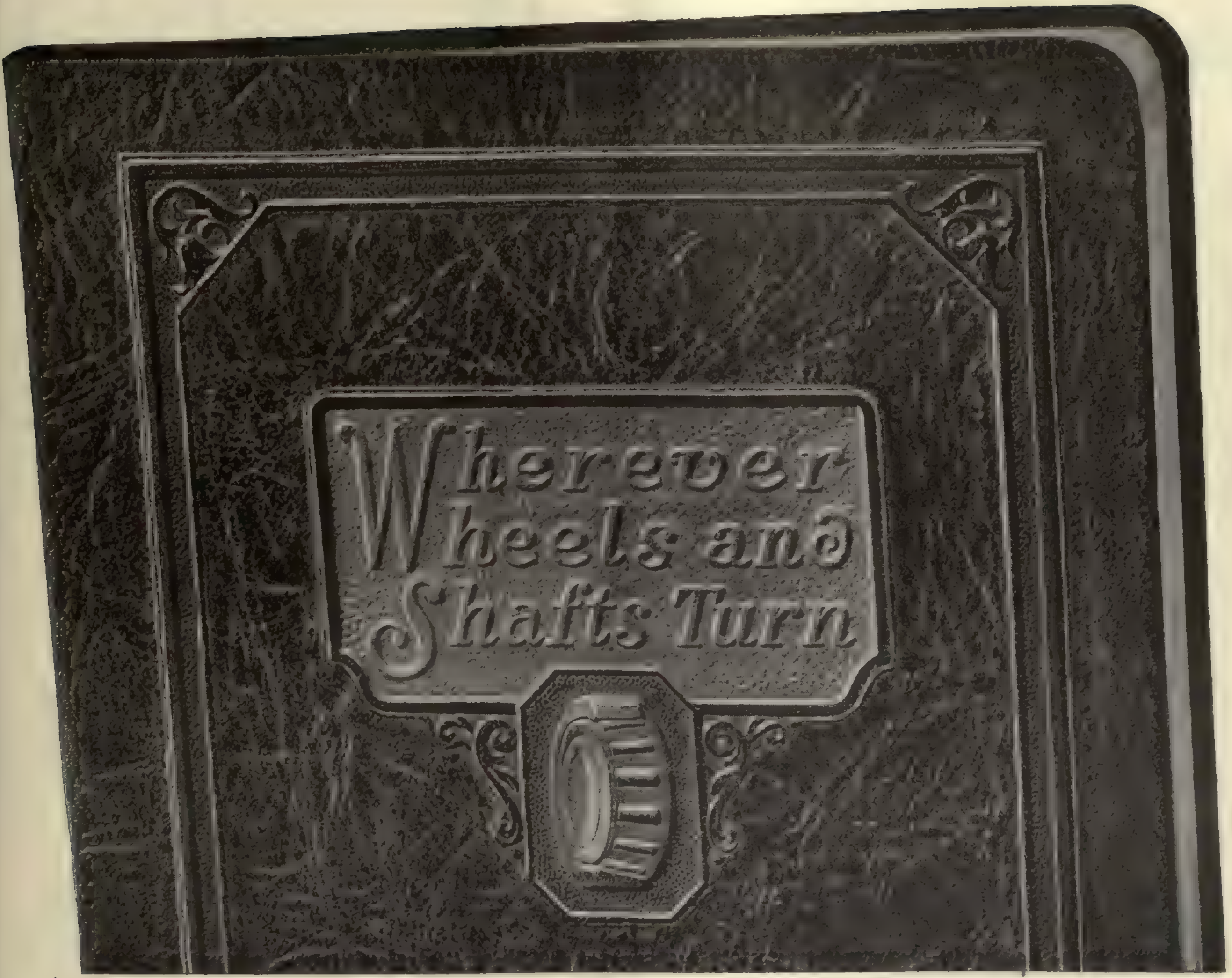

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Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

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A New Kind of "Drive" Is Needed

DURING the last few years there has developed within the electric railway industry a recognition of the fact that the business of urban transportation is to a large extent a merchandising enterprise, that the sale of rides can be fairly compared with the sale of any other commodity, and that one of the principal problems confronting the industry has to do with salesmanship. Yet it must be admitted that one of the greatest essentials for sales success, namely, the training of the sales force, has not received the attention it deserves. However capable the average trainman may be in other respects, it cannot be disputed that, by and large he is none too efficient as a salesman. That is not because he is congenitally inept or incapable of learning, for he has learned to do other things with a commendable degree of efficiency. Indeed, it is in no small measure due to the men on the platform that the industry has been able to hold its ground during these last few difficult years of increasing costs.

Some time ago the call went out for power saving campaign as a means of cutting down expenses. The motorman willingly and ably responded to the appeal by improving his technique of feeding his controller and by taking advantage of every opportunity to coast. Starting as a special "drive," the saving of energy soon passed into regular routine and became a definite part of the duties of a good operator. Similarly, when the drive against accidents was initiated in a further effort to reduce expenses it was to the man on the platform that the appeal was made, and again the response was prompt and effective. The safety movement, starting as a drive, with safety weeks and safety months, has progressed to a point where it is no longer a sporadic effort but a day-to-day job, in which both the conductor and his motorman take a commendable pride. By means of energy saving and accident prevention, both brought about through the intelligent co-operation of the men on the platform, the operating expenses of electric railways have been progressively reduced by many thousands of dollars.

Now the time appears to be at hand to initiate another industry-wide movement, having as its objective the training of the platform man in the sale of rides. From saving energy and avoiding accidents the operator must be called upon to acquire the technique of salesmanship. With little more than the age-old qualities of courtesy and tact and a neat personal appearance upon which to build, he must acquire and put into practice that intangible something, that indefinable quality which will so commend itself to the average patron as to induce him to continue and increase his patronage. Individuals there are in every group of trainmen who already possess this quality to a marked degree. On every property are to be found men with whom the patrons like to ride. With these men as a nucleus around which to build and with the knowledge of sales psychology which is available from other sources, it should be possible to develop the average train force into a group whose presence would be a constructive force in any community. The stake is well worth playing for and a step in this direction would appear to be the next logical development in an industry that must go ahead if it is to survive.

Forward Looking Rapid Transit Project in Cleveland

GREAT things transit-wise appear to be ahead for the city of Cleveland. In one of the most comprehensive plans of its kind ever advanced, the Van Sweringen interests, in a proposal to take over the Cleveland Railway and certain suburban systems, have indicated their true appreciation of the physical side of the problem of supplying suburban service to the modern community. The plans are still in embryo, but even as partially divulged they indicate that the problem of local transit in and about Cleveland is to be approached on the basis of the co-ordination of that service with that of the entrance of the trunk lines into the city. This is most important.

As in so many other cities the situation at Cleveland has plainly become one in which rapid transit for the longer hauls is necessary. At Cleveland, however, it has been recognized that this rapid transit service should be provided by one agency and not by several competing agencies since that means waste in duplication of facilities.

This recognition alone is significant, but it is still more significant that a militant attitude should be adopted toward it and that recognition should be accorded the existing city transit system in the proposal. Contributions of the Van Sweringens to the growth and development of Cleveland have already shown that they, working with the Cleveland Railway, are incomparably better equipped to study and respond to the new and the real needs of the city in this direction than any new company possibly could be. In fact, this is so obvious as to be self-evident.

The vehicle under which the Van Sweringens propose to work is the Metropolitan Utilities, Inc. That company would control practically all of the public transportation facilities in the metropolitan area of Cleveland, and to the new company would be intrusted the further building of such facilities. Stockholders of the Cleveland Railway are being asked to deposit their stock. While it is too early to predict the outcome, acceptance of the proposal by them appears to be assured. President Alexander of that company and other members of the rapid transit committee favor the proposal. As they see it, operation of competitive facilities would inevitably result in waste and excessive costs, while co-ordinated control and operation of transit facilities in the metropolitan area will result in decreased cost of furnishing service.

In this move Cleveland would appear to take the lead in rapid transit planning under the far-sighted direction of President Alexander and his associates in the Cleveland Railway, and the equally far-sighted planning of the Van Sweringen interests. There may be some occasion for questioning certain economic phases of the plan, particularly the apparent intention to build with private capital rapid transit facilities which involve heavy fixed charges that become a permanent burden on the community's transportation facilities. But in its physical aspects, and in its recognition that public transportation in a community or metropolitan district is a natural monopoly, the Cleveland proposal is a forward-looking enterprise.

Business Does Its Own Purging

COLONEL STEWART of the Standard Oil of Indiana has gone down to defeat in a contest unusual in the annals of American business. Doubtless it was difficult for the employee-stockholders to realize that the debonair chairman of the board who walked pleasantly among them was the same man associated with the story of secrecy and evasion unfolded at Washington, one of the four responsible participants in the affairs of the phantom Continental Trading Company, the books of which were destroyed and the identity of which faded as mysteriously as its form had taken shape.

It is only right that conclusions should be drawn carefully and that the accused should have the benefit of any doubt. There has been much doubt, and on a technical point the jury acquitted the Colonel. But the fact remains that the Supreme Court said of the Continental Trading Company that it "was created for some illegitimate purpose." If the premise be accepted that a profitable end justifies any means, there would be no more to be said. But that premise is not tenable. Dividends are desirable. But they do not rank ahead of ethics. In seeking to make a contest on the issue Colonel Stewart was ill-advised by his friends. As the *Wall Street Journal* so forcefully said, "modern conceptions of corporation management, while demanding business ability still require that something higher than profits shall be shown."

In the defeat of the Colonel for re-election a salutary lesson lasting in its effect appears to have been administered quite as effective as any the courts could have dealt out, since it evidences again the growing disposition of business to administer its own rebuke to proponents of practices among its members that do not square with the revised business morality of the present day.

Adding to the Convenience of the Patron

GOOD merchandising, whether it be of a luxury, a commodity or a service, requires that attention be paid to the convenience of the customer. It must be made easy for him to buy, or he is not likely to undertake the effort unless he is particularly desirous of obtaining what the merchant has to offer. When the sale is that of a service the facilities for making the customer acquainted with the service are an essential part of the product itself. The enormous increase in the use of electricity in the home, for instance, is due in no small part to the many campaigns made directly to the user to show the convenience obtainable with some new device, or to indicate additional uses to which a device already installed may be put.

With transportation systems the problem is the same in principle as it is in other lines of business, but there is considerable difference in the methods that must be employed. For the average patron the rail or bus line is not directly at the door of his home, nor is it always adjacent to his place of business. When the patron gets off his daily beaten path it is necessary for him to learn the most convenient routes and the car schedules.

It is for the benefit of such patrons that the methods used on the London Underground have been developed. These have been discussed in this paper from time to time. In last week's issue appeared a series of illustrations of the latest developments of the Underground to direct its patrons. Destination and route signs are used effectively to prevent confusion and uncertainty on the part of the passenger, so that he may save time and worry. The methods used are the result of careful study, and are of great value in making the use of the transportation facilities pleasant and profitable. Some of them are similar to arrangements in use in this country, while others are entirely novel. A study will indicate that practically every one of them can be adopted here, although some are especially adapted to rapid transit lines. With the present-day demands of the patrons for more convenient transportation service, no company can afford to do otherwise than to adopt similar means of giving the patrons all the information possible as to routes and destinations of its vehicles.

A Property That Helps to Make Circumstance

YEAR after year certain street railways publish annual reports which are most heartening. One of these companies is the Chicago Surface Lines. True, Chicago is a big city—a city of magnificant distances. It is growing fast, but the explanation of the extraordinary record made by that company is not to be found there. The ordinary explanations do not account for the growth in gross receipts from $31,966,049 in 1915 to $62,391,622 in 1928, in total rides from 1,115,312,129 in 1915 to 1,621,215,876 in 1928 under an average fare per ride that has advanced from 2.81 cents in 1915 to 3.80 cents in 1928.

Circumstances of the growth of Chicago and other economic factors do, of course, play some part in the final record. But under similar circumstances other systems elsewhere show an entirely different trend. Furthermore, the rate of fare charged by the Chicago Surface Lines is 7 cents, which is considerably less than the average for the industry. For the explanation of the unusual results achieved by this property in increasing riding and earnings one must look beyond mere circumstances to the attitude of the management itself. Even there one finds little that is spectacular or novel. In the last analysis, this property is producing results by the simple process of putting into practice the principles which have been widely discussed within the industry for several years.

First of all, the Chicago Surface Lines management has confidence in the possibilities of the local transportation business. It believes that patronage can be attracted by improvement of service, and it has more than proved this to be a fact. For several years the property has been speeding up its cars to the uttermost and striving toward the objective of "a car in sight" as a policy for increasing off-peak riding. The extent to which this policy has been applied is reflected in a service increase for the fiscal year ended Jan. 31 of 728,354 passenger car and bus-miles. Every year since 1922 there has been a corresponding increase in traffic. For the year just closed the increase in total rides was 35,774,749 and in revenue passengers 10,355,973. All the more remarkable is this record since, as the ELECTRIC RAILWAY JOURNAL has pointed out before, the system is without adequate credit and is operating under temporary franchise extensions due largely to a badly muddled political situation and no real assurance of its future operating rights.

Keeping up to date is a fetish with this management. A new world's record for the operation of every car on five successive days was established by the Chicago Surface Lines for the period Dec. 17 to Dec. 21, inclusive, when 3,639 cars were in service. Such records are merely some of the talismans that tell the tale. Too many street railways, far too many, wait upon circumstance. The Chicago management helps to make circumstance, where circumstance is within the possibility of its molding.

Electrification Receiving New Impetus

QUIETLY but steadily the work of electrifying the steam railroads is going ahead. The article appearing in the JOURNAL this week treating of the expansion of the facilities for power supply to handle the trains of the Pennsylvania Railroad in the Philadelphia-Wilmington district gives an indication of the magnitude of the work involved. While the installation is made necessary by the extension of the electrified zone to Wilmington, already in service, the present demand is much less than will be the demand when the electrification northward to New York is completed and all the trains in the vicinity of Philadelphia are moved with electric power.

Electrification has been facilitated greatly by the use of power purchased from the local utility company, as it is in Philadelphia, and as it is planned to do with other electrification projects of the Pennsylvania. The power loads in railway service are large and fluctuate over a wide range, so that if independent power plants are built they must be of great maximum capacity compared with the average. When purchased power is used it is possible, on the contrary, to adjust schedules so that train movements, particularly of freight and certain long-distance passenger trains, are made at such times that the additional power does not add in full value to the industrial and lighting peak. Thus the railroad can obtain power at a cost usually less than if it were generated in the company's own plants, and the investment of the railroad itself is reduced materially, since power facilities are one of the major items in the cost of electrification.

The installation discussed in the present article is only a small part of the entire project being put through by the Pennsylvania. While this project when completed will be the largest in America, other roads in the United States already have electrification work under way or have announced plans that represent major additions in the progress of electrification. These have been referred to in this paper from time to time. In the aggregate the contracts already made will increase the mileage of electrified track in the United States within the immediate future by about 2,000 miles, or 50 per cent of the existing mileage shown in the review published in the issue of Jan. 12. It also is well known that other railroads have been studying the subject intensively. The success of the present electrifications and the great advantages, particularly in the handling of heavy traffic, of electric operation, are bound to bring about an extension far beyond what has yet taken place or been announced.

Lack of Regulation Is Taxicab Weakness

IF ONE were to judge from surface indications alone it would appear as though the taxicab had elected to follow the path of the discredited jitney. Of course, this is not the case as the taxicab has a legitimate place in the transportation picture along with the street car and the rapid transit train, but certain recent developments in which taxicabs have been involved are anything but reassuring to those who have any interest in the future of this very much troubled industry.

From many sections of the country, from large cities as well as small, come accounts of taxicab wars, of the attempted establishment of single-fare or zone-fare taxicab systems and of the difficulties arising out of various and sundry attempts of taxicab owners and operators to make money by selling goods below cost. Seldom do we hear of a competitive taxicab system bidding for business upon the basis of better service, of safer service or of more courteous drivers. Always it is lower fares or longer hauls for the same fare. And all attempts of this nature lead inevitably to the same result, the failure of the operators, poorer service instead of better, and loss of credit and disillusionment all around.

From its very inception there has been something fundamentally unsound about the taxicab industry as it is generally conducted. The question of a proper rate of fare aside, too much dependence has been placed upon practices which have long since been outlawed or tabooed by the legitimate carrier. Almost alone in the transportation industry the taxicab driver depends for a living upon long hours of service, supplemented by tips. Put the independent taxi driver on an eight or a nine-hour day and deprive him of the hand-outs which he receives from his passengers and he would not stay on the job a month. In the course of time the matter of hours of labor will probably adjust itself, but the tipping evil is apparently here to stay and will continue to be the bait held out to induce the uninitiated outsider to try his luck in the business of public transportation. A small matter, perhaps, but sufficient to throw the entire industry out of balance when it comes up for regulation and economic consideration.

The lack of regulation has, of course, long been apparent, and is probably the basis of most of the afflictions by which the industry is plagued. In certain instances the cut-rate taxicab has been given the tacit support of city authorities on the theory that cheap transportation and plenty of it without regard to the cost can be synonymous with good transportation. Fortunately this idea has been pretty generally discredited and is now rapidly going into the discard. With the growing recognition of the fact that the principal function of the public highway is to serve as an avenue for the movement of traffic has come a realization of the necessity for the proper regulation of all vehicles using these avenues. The taxicab cannot continue to dodge the issue indefinitely, and with proper regulation will come an end of many of the evils with which the industry is beset.

Erie Canal Now Rochester's Subway

Overhead of the rapid transit line designed for high-speed service. Grooved intermediate wire and single No. 0000 grooved contact wire suspended from 1.02-in. messenger

In the oval is a view of the old Erie Canal in Rochester, where it passed over the Genesee River. This same section, now occupied by the subway and decked to give a new street to the city's downtown section, is shown in the other view

THREE years previous to the opening of the Erie Canal, on Oct. 29, 1822, a consignment of flour left Rochester by canal boat bound for Little Falls, N. Y. This was the first shipment of merchandise offered by the city to the new, and as yet uncompleted, Erie Canal, and marked an important event in the transportation history of Rochester. Just 106 years later a second important date in the transportation history of the city was recorded with another initial shipment over the same canal bed. However, instead of being carried by boat, the shipment was carried by rail and over a 9-mile rapid transit line.

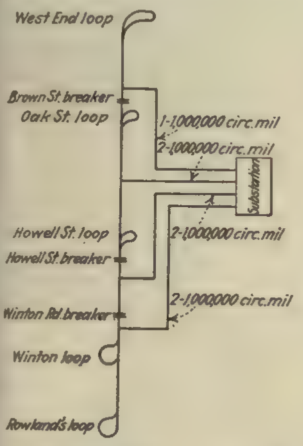
During the first six years after the opening of the Erie Canal, Rochester grew from a village of 2,700 to a town of 11,000. The completion of the subway seems likely to stimulate another growth in the city. It has already increased bordering real estate values as adjacent lands have been purchased and new industries have moved into the section served. It appears that the payment of $12,000,000 by this municipality for the undertaking has already proved a sound investment.

Because the new Barge Canal does not make use of the old bed of the Erie Canal, negotiations were started in 1911 for the abandonment of the lands of the latter within the city. In August, 1921, the Common Council authorized the acquisition of these lands. Plans already had been made by E. A. Fisher, then city engineer, for a railway in the bed, the railway to be used particularly for interurban cars and freight. There were many industries located adjacent to the canal and Mr. Fisher's plan offered an excellent method for freight interchange.

When in January, 1922, the State of New York ceded the canal lands to the city for a consideration of $1,500,000, plans had been made for the laying of tracks from Monroe Avenue in the town of Brighton to Western Widewaters near Driving Park, a distance of 9 miles. The plans called for two tracks to extend the full length of the proposed route and, in addition, one freight track for 7 miles and two other freight tracks for 1½ miles. Connections were proposed with the Rochester & Eastern, the Rochester & Syracuse, the Rochester, Lockport & Buffalo, the New York Central, the Lehigh Valley, the Erie, the Buffalo, Rochester & Pittsburgh, and the Pennsylvania Railroads. These plans all have been accomplished with the exception of the Pennsylvania and the Erie, whose connection cannot be made until an old canal race is abandoned. In addition to these, connections with the New York State Railways' surface lines have been made at Monroe Avenue, Oak Street, Lyell Avenue and Emerson Street.

Prior to the completion of the subway, a citizens' advisory committee suggested that the New York State Railways operate the subway. Accordingly, the Common Council in November, 1927, arranged for the New York State Railways to operate the subway under their "service-at-cost" contract.

At the present time rapid transit cars operate on a ten-minute headway during rush hours and a twenty-minute headway on base schedule. During the first month of operation, December, 1927, 85,248 passengers were carried, and in March, 1928, 116,633 were carried. The number of passengers has increased steadily from that time until the present. In addition to the regular city lines all interurban lines are using these tracks. Shelter stations are located approximately every half-mile along the system. At the City Hall station there is a comfortable waiting room with interurban ticket office, newsstand and rest room.

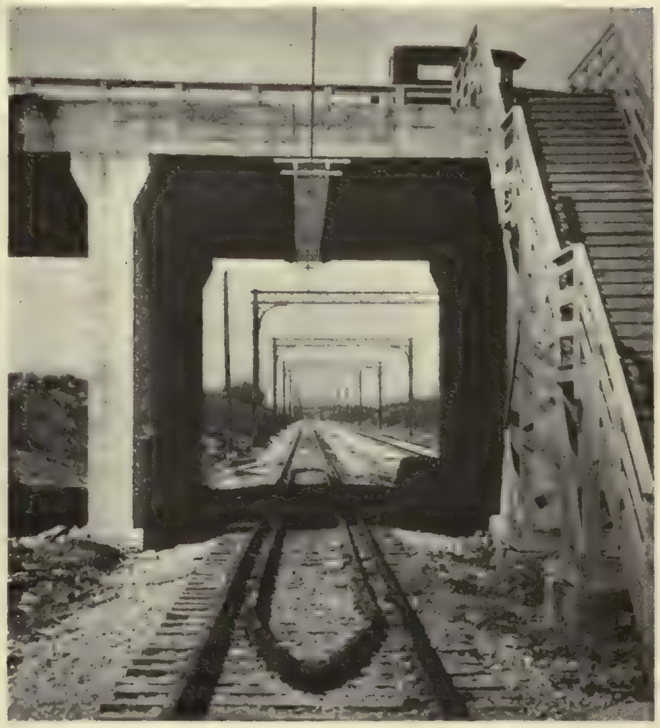


Feeder diagram of the system, showing how the line was divided into four sections, each fed separately from the substation

The legal formalities which opened the subway for use by the New York Central, the Lehigh Valley and the Buffalo, Rochester & Pittsburgh Railroads were transacted on Aug. 31, 1928. At the present time the freight interchanged by these railroads is being handled by one electric locomotive.

With the exception of a few locations all structures supporting the overhead are of the bridge type, spaced 300 ft. apart on tangent. Practically all bridges span four tracks, a few, however, spanning five. Some of the bridges are as long as 90 ft. Tubular steel poles are used for special pull-overs and loops while many wood poles are used on commercial spurs. Pole bracket construction is used almost entirely on these spurs.

The trusses as well as the columns that make up the bridge structures were erected by a self-propelled locomotive crane with a 60-ft. boom. For column setting the crane was located on the track nearest to the cement foundations. For swinging the trusses into position from the flat cars, the crane was located on one of the center tracks. Wherever possible the steel was placed on top of the retaining walls. This decreased the amount of steel needed and simplified the structures. This also gave a decided advantage on curve structures where large end thrusts were encountered. Incidentally, on one of the curves near the aqueduct an end thrust of 20,000 lb. has been attained during winter weather.



Catenary construction was used on all open-track main line of the Rochester rapid transit line

Overhead Designed for High Speed

The overhead system, designed for rapid transit service, consists of a 1.02-in. diameter copperweld-copper messenger wire from which is suspended a No. 0000 grooved intermediate wire. A single No. 0000 grooved contact wire is suspended, in turn, from the intermediate wire. The contact and intermediate wires are of the same material: phono-electric on one section and cadmium-bronze on another. Connections between the main messenger and intermediate wire are by means of bronze rigid hangers, spaced approximately 20 ft. apart. The contact wire is suspended 6 in. below the intermediate wire with flexible hangers of the loop type. To prevent arcing of loop hangers during the period when a car is drawing current from the contact wire, frequent copper bonds have been inserted between the contact and intermediate wires.

The main messenger has a breaking strength of 49,000 lb. and an area of 587,000 circ.mil. The combined intermediate and contact wires have an area of 254,000 circ.mil, making a total of 841,000 circ.mil for the overhead system and a total of 3,364,000 circ.mil for the four-track system downtown. This section is fed

At left—The messenger end of the curve hanger is clamped securely to the messenger wire. At right—The intermediate wire is held in the curve hanger by peaning-over a lip on the top of the clamp

A locomotive crane made cable stringing comparatively easy

with two 1,000,000-circ.mil copper feeders. All messenger wires, with the exception of those for the commercial sidings and loops which are directly suspended, and those in the covered section of subway, are insulated and suspended with two suspension insulators. They are of the ball-and-socket type with a 7½-in. shell diameter and 5-in. section length. A closed-seat, forged-steel, suspension clamp is used on all tangent and curve work. A combination mechanical grip and cast-spelter button clamp is used for dead-ends and splicers. A split chuck surrounds the cable and is backed up by a spelter button, cast on the end of the cable. The split chuck is tapered on the outside and fits into a sleeve which is cone-shaped internally. Pulling the cable forces the spelter button to push the split chuck deep into the cone-shaped sleeve, thus causing the split chuck to grip the cable. The main messenger dead-end insulation consists of two parallel strings of 4¾x6¾-in. porcelain strain insulators, two units per string. Each string has an ultimate breaking strength of 30,000 lb., thus providing a dead-end assembly capable of withstanding any strain imposed on the main messenger. The porcelain insulators are assembled with copper U-bolts, the copper bolt having about the same characteristics as the strand at the mechanical loads encountered.

Dead-ends for the intermediate and contact wires are made to the same steel yoke. Insulation of similar design, but smaller in size and strength, is employed. The No. 0000 grooved wire is held with a clamp containing a chuck similar to the Cleveland splicer.

Construction for Curves

On curves a 10½-in. high-strength insulator was used for supporting the messenger wire. Many of the curves of greater degree required two strings of these insulators with a total breaking strength of 30,000 lb. All curves with the exception of approaches to stations, which had only a slight curvature, were constructed with incline catenary. A solid or rigid bronze clamp allowing 6 in. of separation between the intermediate and contact wires was designed for the curve hanger. The lower or contact wire was clamped while the intermediate wire was held by peaning-over a lip on the top of the clamp. The hanger rod was inserted through the center of the clamp and held with nuts on both sides. The messenger end of the hanger was clamped to the messenger wire. Thus good feeder taps from the messenger wire to the contact wire were made.

On the higher degree curves, particularly the 12 to 18-deg. sections, the curve hanger rods are almost horizontal. With the usual construction, employing an intermediate wire 1½ to 2 in. above the contact wire, pantograph operation would be impossible. In the Rochester construction there is a clearance of 3 in. from the hanger rod to the pantograph shoe at the contact wire. This clearance together with the slight upward angularity of the hanger rod provides sufficient clearance for future pantograph operation.

The overhead wires were cross-bonded at approximately 1,000-ft. intervals. Lightning arresters also were cut in at these points.

Overhead in the Subway Proper

All overhead in the subway proper was suspended from a wood trough. Standard composition mine hangers and a mechanical feeder clamp suspended at 20-ft. intervals supported the intermediate wire, the main messenger wire being dead-ended at the entrance of the subway and carried through as feeder only. The contact wire was connected to the intermediate wire with duplex clips at 10-ft. intervals. Steadies and pullovers were made by replacing the short bolt in the duplex clip with an eyebolt and eyenut, a guy wire being attached to the eyes. Incidentally, all guys within the railway, as well as those outside, were double-insulated with porcelain strain insulators.

At the present time the use of wheels and shoes requires trolley frogs at all turnouts and crossovers. Clearance, however, is provided for pantograph operation on the main line, but not on the loops and a few of the sidings.

Non-ferrous materials were used in the overhead system where feasible. The parts included cables, catenary hangers, intermediate hangers, pullover fittings, splicers,

A typical curve span showing hanger location

Staging on box and flat cars aided the linemen in connecting catenary hangers

dead-ends, and other hardware. Such items as suspension clamps, insulator caps and pins were of steel and malleable iron. The non-ferrous parts were constructed from selected grades of bronze.

Track and Bonding

The roadway was built with 90-lb. A.S.C.E. rail, laid on tie plates and 7-in. x 9-ft. ties, with washed gravel and cracked stone ballast. The roadbed was located in a cut throughout its length which required an extensive drainage system. It was estimated that future surfacing and ballasting will raise the roadbed outside of the subway proper about 6 in. This was anticipated during the overhead design and, consequently, all suspension insulators on tangent were suspended with a steel strap which would permit of 6 in. of shortening, thus maintaining the original contact-wire height.

The track was bonded with gas-weld, steel terminal bonds of No. 0000 capacity. This work was all handled by contract. Frogs, crossings and other special work were bonded with long bonds. Future bonding can be handled with arc-weld bonds, the power being drawn from the 600-volt d.c. overhead system.

Educating the Public Concerning Traffic

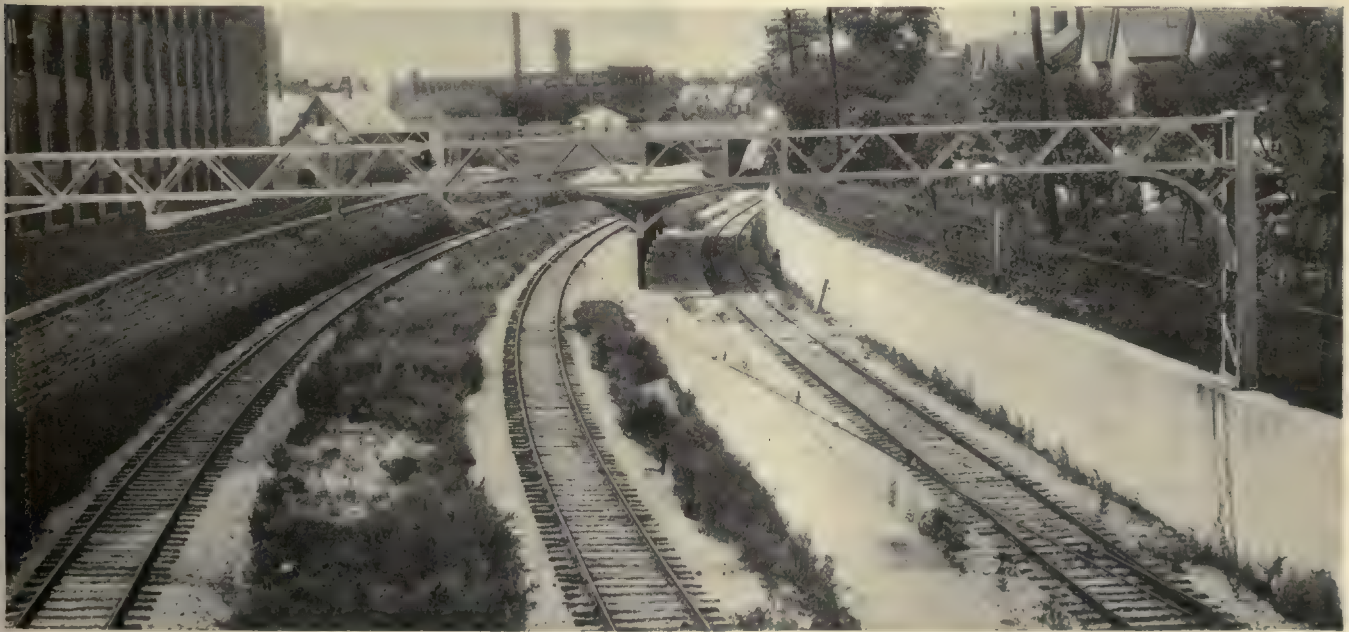
P.R.T. uses many lines of approach in arousing interest in efforts to reduce street congestion

MOTION pictures, radio talks, newspaper stories and advertisements, signs and folders in cars, cabs and buses and a prize contest for letters suggesting cures for traffic ills all served to arouse public interest in the traffic problem during the "80 per cent" campaign recently carried on by the Philadelphia Rapid Transit Company. Besides centering attention on the congested condition of Philadelphia's streets, the campaign, by emphasizing the urgent necessity for traffic relief, served also to enlist the co-operation and sympathy of the people of Philadelphia in a traffic survey now being undertaken by Mitten Management.

This annual campaign takes its name from the fact that 80 per cent of Philadelphia's street users make use of public transportation mediums. "Give the 80 Per Cent a Square Deal" has been the slogan of these campaigns, which have endeavored to point out that the 20 per cent who do not use the street cars and buses utilize a great deal more than 20 per cent of the available street space, especially when parking is permitted in the downtown district.

The use of the motion picture, the radio and the letter contest constituted the principal points of departure from last year's campaign.

"The Peace Time Big Parade" was the name given the motion picture which portrays the similarity between the movement of troops in wartime and the daily trans-



The presence of retaining walls materially decreased the cost of steel for supporting the spans portation of the "Peace Time Army" in a modern city. Official government war pictures were used and were interspersed by pictures taken in the streets of Philadelphia and at different locations of the transit organization. One of the best shots was taken in the early morning and shows a seemingly endless procession of cars streaming forth from the barn to make their first trip of the day.

"The Peace Time Big Parade" was shown in more than 30 theaters in Philadelphia and surrounding territory to an estimated audience of 115,000. In addition, it has been shown in connection with nine talks on traffic ills before various organizations. A 16-mm. film was made from the standard film, so that the picture might be shown with a small projector if desired.

Mitten Management's half hour program over station WIP each Friday evening was devoted wholly or partly to the 80 per cent campaign on eight occasions. It was used not only for traffic talks but also to announce the traffic survey and the prize letter contest. The winners of this contest were also announced over the radio, the program being extended to an hour for this purpose, and the first five winners gave short talks at this time.

This contest offered prizes aggregating $500 for letters of 1,000 words or less giving practical suggestions for the alleviation of traffic congestion. Proposals of huge engineering projects such as double-deck streets, overhead sidewalks or underground trolley service in the downtown district, measures involving great expense and requiring many years for completion, were discouraged, the car-riders being asked instead to devise measures which would secure more immediate relief.

Public interest in traffic betterment was well demonstrated by the results of this offer. For although the prizes were not large (first prize $125, second prize $100, third price $75, fourth prize $50, fifth prize 25 and 25 prizes of $5), nevertheless 1,936 letters were received between Nov. 19, when the contest was announced, and Dec. 15, the closing date. These letters were all read and acknowledged and the suggestions tabulated. All of those which showed promise were copied and sent to a committee of traffic engineers who graded them and awarded the prizes.

The top prize winners turned out to be men quite conversant with traffic problems. First prize was won by T. Elmer Transeau, an instructor in highway engineering at Drexel Institute, Philadelphia. William V. Brandt, the second prize winner, is with the Electric Storage Battery Company. The third man, H. C. Crowell, is assistant to the chief engineer of the Pennsylvania Railroad, while the fourth, T. H. Henkels, is an engineer with the Commercial Traffic Association.

It is interesting to note that the point most generally discussed was the parking problem, 521 contestants having introduced this into their letters. Of these, 133 proposed total abolition of parking in the downtown district. Another much discussed subject was the restriction of delivery trucks in the downtown district. Contestants to the number of 236 agreed that a more rigid control of deliveries would speed up the movement of traffic, while many of these saw in consolidated delivery service a partial solution of the problem.

Other suggestions made included abolition of the horse-drawn vehicle in the central business district, pedestrian traffic control, legislation to keep slow-moving vehicles off the car tracks, boulevard stops, skip stops, the segregation of trolley and vehicular traffic in the downtown streets, city-built garages in the central business district, staggered office hours, side-chute coal trucks, the elimination of grade crossings and the marking in a prominent manner of a belt line around the city.

The contest was not without its humorous side. Some of the suggestions were very fantastic indeed, including such things as placing derricks atop the trolleys to pick up automobiles that go dead on the tracks and the running of trolleys in the wrong direction on one-way streets, so that autos would perforce keep off the tracks.

Most of the letters, however, were fundamentally sound, and while no startling new and at the same time practicable ideas were proposed, still the contest was considered highly successful in view of the good will and public interest which was developed. For, if nearly two thousand people took the trouble to write letters, it must necessarily be assumed that a great many times that number gave some thought to the subject.

The letter contest, as well as the whole 80 per cent idea, was given wide publicity through newspapers and through folders and signs on the cars and buses. The "80 per cent" idea has by this time become so familiar to Philadelphians that it is no longer necessary to define the phrase. Consequently the ads carried such messages as "Help to keep traffic moving for the 80 per cent" and "Broken down vehicles caused 151 delays to the 80 per cent in October," without attempting to explain the meaning of "the 80 per cent."

Another bit of favorable publicity during the campaign came with the announcement of the new corps of co-ordinated supervisors for the downtown district, men who have charge of trolley cars, buses and taxicabs.

The whole campaign has served to bring the public face to face with the problem which confronts Philadelphia. Progress reports of the Mitten Management traffic survey are assured of an eager audience, and there is reason to expect that the whole survey will be given thorough consideration by the people of Philadelphia.

◆

Yankee Thrift Emphasized in Advertisement

"DOWN in the State of Maine" old-fashioned Yankee thrift is still a prevalent characteristic of the population, and the Biddeford and Saco Railroad has not failed to recognize this in its publicity, as can be seen from the accompanying example of its advertising.

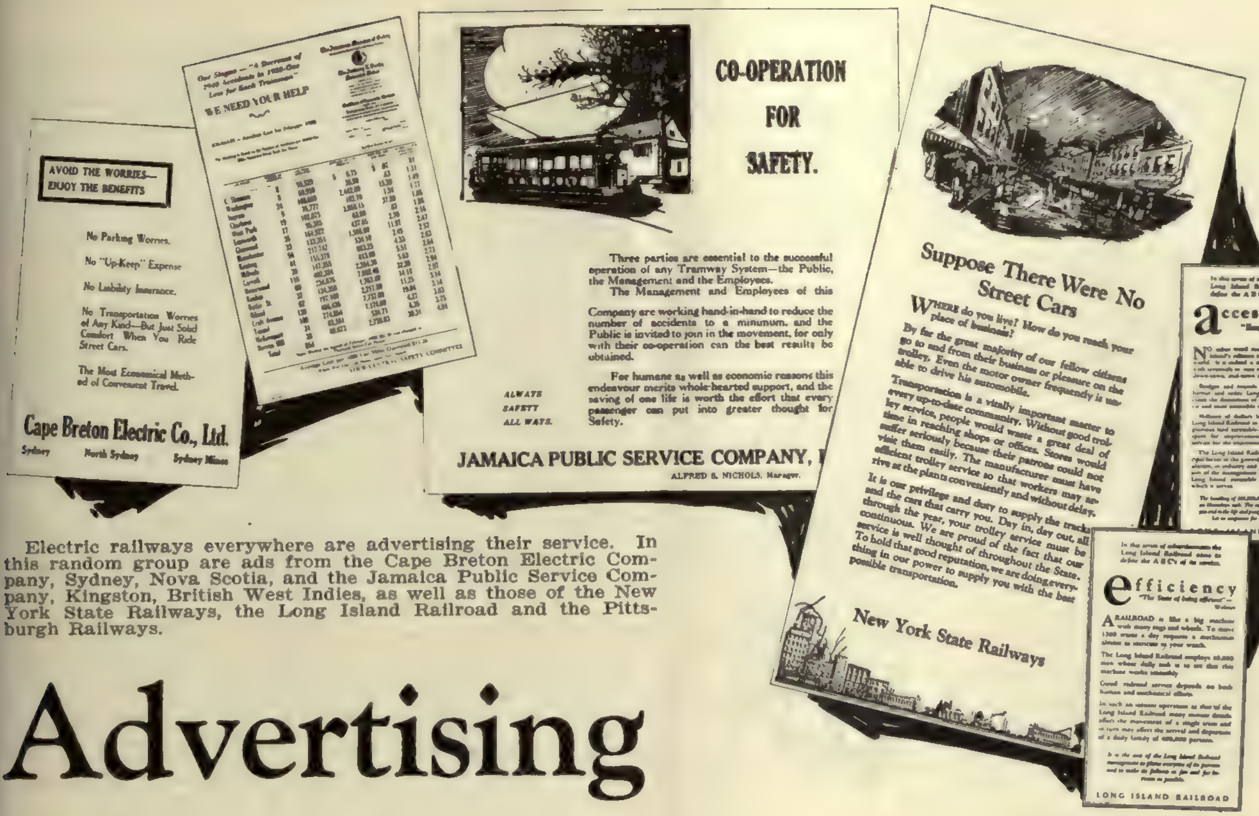
A Shiny Penny Seems More
Valuable to A Child Than
A Worn Half-Dollar (Try it and see)

To some adults of middle age the bright attractiveness of a new, "inexpensive" (?) auto seems of more immediate value than a well filled bank book.

But as old age draws on, and the burdens of life weary one more quickly, the passing extravagant pleasures of former years are overshadowed by the needs of the day. .... Then he who knew the real value of money is prepared for ease and comfort.

Among the average rank and file of us,
that man is the street-car rider.

Biddeford and Saco Railroad Co.
"A FRIEND TO THE THRIFTY"



AVOID THE WORRIES—
ENJOY THE BENEFITS

No Parking Worries.

No "Up-Keep" Expense

No Liability Insurance.

No Transportation Worries of Any Kind—But Just Solid Comfort When You Ride Street Cars.

The Most Economical Method of Convenient Travel.

Cape Breton Electric Co., Ltd.

Sydney North Sydney Sydney Mines

WE NEED YOUR HELP

CO-OPERATION FOR SAFETY.

Three parties are essential to the successful operation of any Tramway System—the Public, the Management and the Employees.

The Management and Employees of this Company are working hand-in-hand to reduce the number of accidents to a minumum, and the Public is invited to join in the movement, for only with their co-operation can the best results be obtained.

For humane as well as economic reasons this endeavour merits whole-hearted support, and the saving of one life is worth the effort that every passenger can put into greater thought for Safety.

ALWAYS SAFETY ALL WAYS.

JAMAICA PUBLIC SERVICE COMPANY,

ALFRED S. NICHOLS, Manager.

Suppose There Were No Street Cars

WHERE do you live? How do you reach your place of business?

By far the great majority of our fellow citizens go to and from their business or pleasure on the trolley. Even the motor owner frequently is unable to drive his automobile.

Transportation is a vitally important matter to every up-to-date community. Without good trolley service, people would waste a great deal of time in reaching shops or offices. Stores would suffer seriously because their patrons could not visit them easily. The manufacturer must have efficient trolley service so that workers may arrive at the plants conveniently and without delay.

It is our privilege and duty to supply the tracks and the cars that carry you. Day in, day out, all through the year, your trolley service must be continuous. We are proud of the fact that our service is well thought of throughout the State. To hold that good reputation, we are doing everything in our power to supply you with the best possible transportation.

New York State Railways

accessibility

LONG ISLAND RAILROAD

efficiency

A RAILROAD is like a big machine with many cogs and wheels.

LONG ISLAND RAILROAD

Electric railways everywhere are advertising their service. In this random group are ads from the Cape Breton Electric Company, Sydney, Nova Scotia, and the Jamaica Public Service Company, Kingston, British West Indies, as well as those of the New York State Railways, the Long Island Railroad and the Pittsburgh Railways.

Advertising

An Active Force in Selling Transportation

Red heads, clowns, historical spots, points of interest, company facts and letters of the alphabet attract the public's attention to posters and other mediums bearing messages from the electric railways

THAT the electric railway industry is selling street car and bus transportation by means of advertising, on a scale never before attempted, is forcibly demonstrated by the flood of copy that continues to pour into the JOURNAL's office. Display "ads," posters, window strips and pamphlets covering every phase of the service and employing all psychological mediums to curry public approval are received in every mail from the nation's four corners, from Canada and from the British possessions in the West Indies.

Starting on the west coast, the Portland Electric Power Company, Portland, Ore., recently has completed an extensive newspaper campaign, linked with posters displayed in all of its rolling stock, which accomplished the dual purpose of celebrating the property's twentieth anniversary and selling service.

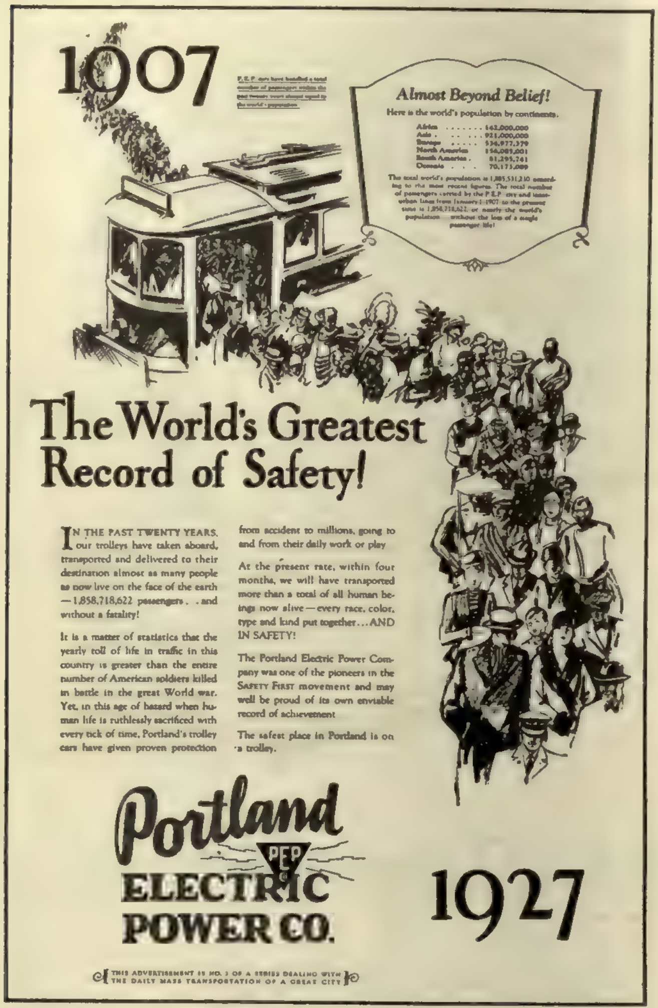
The campaign opened with a full page spread, entitled "That the People of Portland May Be Served." This appeared in the city's four principal dailies. It was followed by a series of 10x14¼-in. and 8x12½-in. display ads attractively illustrated, these appearing alternately in the papers, so that Portlanders read the messages four times every seven days. With each page of copy was carried the notation that it was No. 1, 2 or 3, etc, "of a series dealing with the daily mass transportation of a great city."

Copy for the initial broadside contained eleven paragraphs, stressing the cardinal principles of service, with special emphasis laid upon employee efficiency. Above the main caption and extending across the ad was a list of the 31 trolley lines. Midway on the page and to the left were seven italicized paragraphs revealing such pertinent items as the fact that the company carried 250,000 passengers daily, operated 568 street cars and 33 buses, maintained more than 200 miles of trackage, and operated 41,000 car-miles a day.

Of special significance is "ad" No. 3 in the series, which deals with the safety record of the company—one of the first to foster the safety movement. The copy is striking in arrangement and text. In the upper right-hand corner, framed by a scroll, is given the earth's total population by continents. Beneath the tabulation one reads:

> The total world's population is 1,885,531,210, according to the most recent figures. The total number of passengers carried by the P.E.P. city and interurban lines from January 1, 1907, to the present time is 1,858,718,622, or nearly the world's population . . . without the loss of a single passenger life!

This theme is reiterated in large type, the text ending with: "The safest place in Portland is on a trolley." It is again very effectively employed in a later piece of copy captioned "Mother knows they're safe." In addi-


1907
Almost Beyond Belief!
Here is the world's population by continents.
1927
Portland ELECTRIC POWER CO.
PEP

The total world's population is 1,885,531,210 according to the most recent figures. The total number of passengers carried by the P.E.P. city and interurban lines from January 1 1907 to the present time is 1,858,718,622, or nearly the world's population — without the loss of a single passenger life!

The World's Greatest Record of Safety!

In the past twenty years, our trolleys have taken aboard, transported and delivered to their destination almost as many people as now live on the face of the earth —1,858,718,622 passengers . . and without a fatality!

It is a matter of statistics that the yearly toll of life in traffic in this country is greater than the entire number of American soldiers killed in battle in the great World war. Yet, in this age of hazard when human life is ruthlessly sacrificed with every tick of time, Portland's trolley cars have given proven protection from accident to millions, going to and from their daily work or play

At the present rate, within four months, we will have transported more than a total of all human beings now alive — every race, color, type and kind put together . . . AND IN SAFETY!

The Portland Electric Power Company was one of the pioneers in the Safety First movement and may well be proud of its own enviable record of achievement

The safest place in Portland is on a trolley.

THIS ADVERTISEMENT IS NO. 1 OF A SERIES DEALING WITH THE DAILY MASS TRANSPORTATION OF A GREAT CITY

This striking ad, relating in terms of the world's population the company's safety record, was one of a series prepared by the Portland Electric Power Company

tion to its use in the press, the first safety ad was made into a poster done in several colors, red predominating.

The same punch and attention-attracting phrases characterize the other ads in this series. They cover the much-discussed questions of private vs. public conveyance, traffic congestion attendant upon the use of private cars in business, parking worries, the responsibility of public utilities in storm and stress, and the economy effected by the use of bus service. They bristle with such phrases and captions as these: "There are no 'parking tags' in street cars!" "40 cents for 5 miles or 8 cents a mile," "Are you sure you use your car in business," "Trolley riders never have to say, 'Good morning, Judge!'" "Pay us 8 cents and we take care of your parking," "The street car man will tell you," "Bent fenders and scratched bodies never worry the trolley rider!" and "A cigarette isn't the only thing that makes you walk a mile." In every case the arrangement of text and illustration has been given thoughtful study, ample white space being left to set off the message.

From the Pacific Electric Railway, Los Angeles, Cal., comes an outstanding sample of publicity in the form of a night picture taken from Inspiration Point, Mount Lowe. This is a panorama of 41 miles of territory showing the lights of Los Angeles and 26 adjacent cities. In striking contrast to the light-studded night are five scenes on Mount Lowe which the text of the poster states is southern California's world-renowned resort, located on Pacific Electric lines.

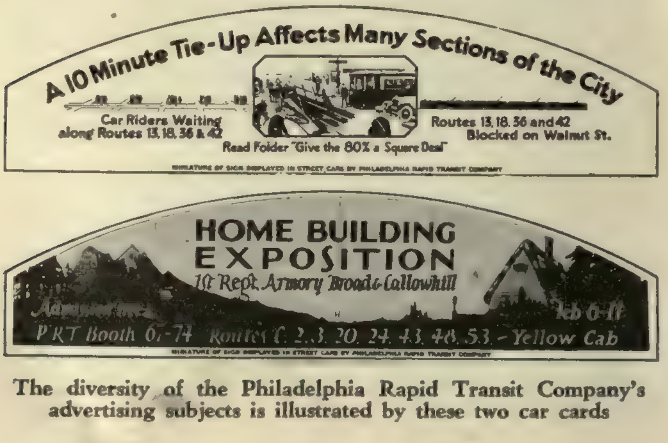
Jumping from the coast to Kansas City, Mo., one encounters another lively newspaper campaign, conducted by the Kansas City Public Service Company, which had a dramatic climax with the publication of an advertisement paid for by employees of the company, as a streamer line at the bottom of the ad states, with money "subscribed in cash by them so that the public and company may know their true sentiments." This piece of copy gave a detailed account of the Brotherhood's agreement with the company, a list of benefits which it enjoys, embracing health, accident and life insurance, free medical and legal advice, hospital and nursing service, and also a creed expressing the employee's duty to the public.

The company's campaign consisted of eighteen display advertisements featuring the "mutuality of interest between the community and its transportation system." Copy was prepared by the commercial department, and the art and layout work by the advertising department and art staff of the Kansas City *Star*. The ads were run in the *Star* and Kansas City *Journal* four times a week.

Display type and illustrations dominated the copy for this campaign, which included selling the property's rehabilitation projects. A skillful combination of type, halftones and sketches was used in this series. One striking ad in this group tells the story of "$705,354 for improvement" by means of thumbnail sketches of and statistics on the number of tons of rails, ties, sacks of cement, cubic yards of sand and crushed stone required to construct new track in localities detailed opposite the material data. A freight train illustration repeats this story in a most effective manner, as does a contrasting view of an old and a new viaduct.

Features of safety and modernization of rolling stock comprised the copy for two of the most striking ads of this series. Costs of private and street car transportation were presented by means of a per cent tabulation on the automobile upkeep per mile as compared with monthly average of 26 round trips via the trolley. The saving effected is shown by a series of entries in a savings account book. As a pedestal for these graphic illustrations there is a forceful testimonial letter on the subject of parking worries vs. comforts of the street car. This letter, from a citizen, was addressed to the president of the company. In striking contrast was a humorous piece of copy revealing, by two sketches, that since the first automobile made its appearance trolley cars have always been considered the safest place in the street.

Invading Canada, one finds that the charming historic points of old Montreal have been presented pictorially to car patrons of the Montreal Tramways in a series of 28 newspaper spreads, under the general caption of "Your

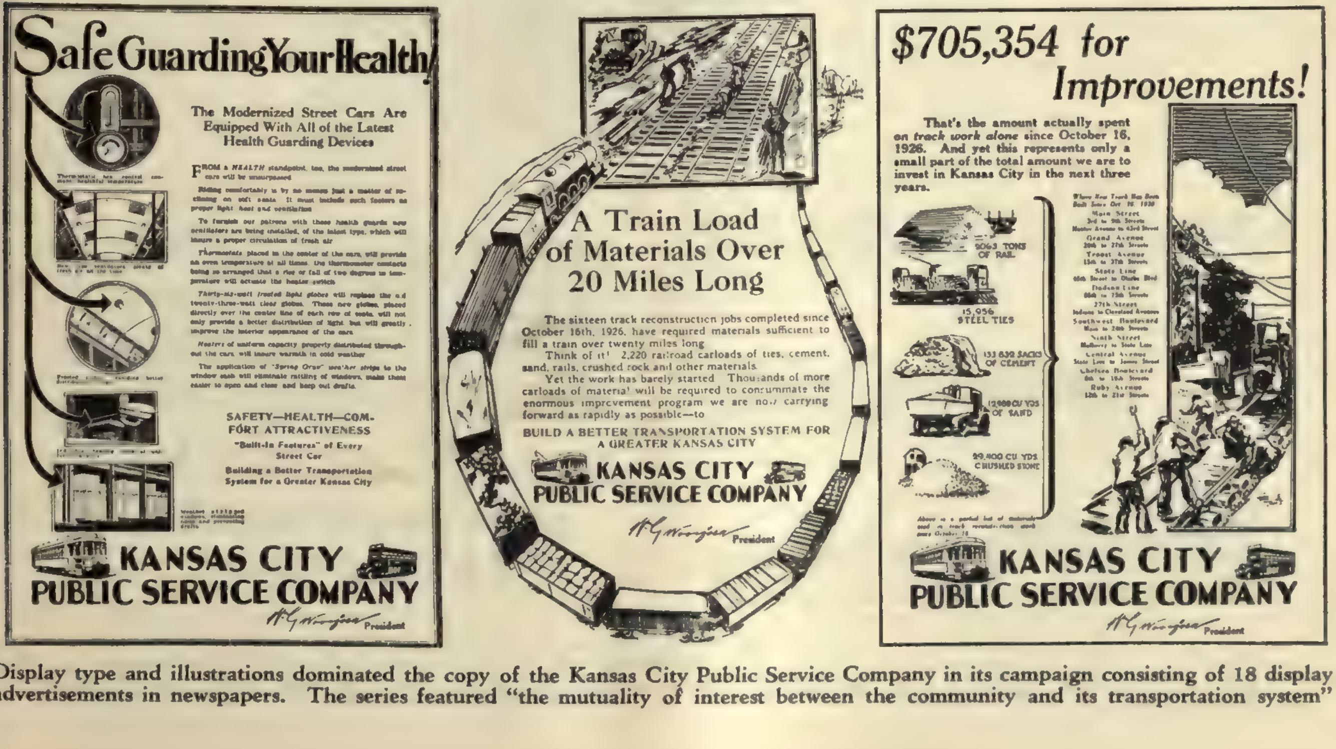

A 10 Minute Tie-Up Affects Many Sections of the City
Car Riders Waiting along Routes 13, 18, 36 & 42
Routes 13, 18, 36 and 42 Blocked on Walnut St.
Read Folder "Give the 80% a Square Deal"
MINIATURE OF SIGN DISPLAYED IN STREET CARS BY PHILADELPHIA RAPID TRANSIT COMPANY
HOME BUILDING EXPOSITION
111 Regt. Armory Broad & Callowhill
Feb 6-11
PRT Booth 67-74 Routes C, 2, 3, 20, 24, 43, 48, 53 - Yellow Cab
MINIATURE OF SIGN DISPLAYED IN STREET CARS BY PHILADELPHIA RAPID TRANSIT COMPANY

The diversity of the Philadelphia Rapid Transit Company's advertising subjects is illustrated by these two car cards

This poster from the Pacific Electric Railway, showing a night picture of Pasadena, Los Angeles and other neighboring cities, taken from Mount Lowe, and five views of the resort itself, is an outstanding example of publicity

Montreal." So valuable were these ads, considered from both historical and artistic standpoints (the illustration in many cases approaching the technique of old wood cuts), that they have been reproduced in a handsome booklet, a copy of which was sent the Journal by Lieut.-Col. J. E. Hutcheson, vice-president and general manager of the Montreal properties. In a letter accompanying the booklet Colonel Hutcheson states, incidentally, that in the first three months of the year the Montreal Tramways carried 4,500,000 more revenue passengers than during the same period of the previous year. Although he does not attribute this increase to the publicity program, the booklet makes one wonder if in some measure it was not responsible for this interesting record.

An analysis of the copy in this series is difficult and is best accomplished with the eye, both from the standpoint of illustrations and the valuable text which accompanies them. Some of the points covered are Notre Dame, Parish Church, Château de Ramezay, Jacques Cartier Square, showing the old market and Nelson Monument, the Cartier Monument, St. Joseph's Oratory, Fort de la Montagne, Notre Dame de Bonsecour, Montreal Harbor,



Safe Guarding Your Health!

The Modernized Street Cars Are Equipped With All of the Latest Health Guarding Devices

FROM a *HEALTH* standpoint, too, the modernized street cars will be unsurpassed.

Riding comfortably is by no means just a matter of reclining on soft seats. It must include such factors as proper light, heat and ventilation.

To furnish our patrons with these health guards new *ventilators* are being installed, of the latest type, which will insure a proper circulation of fresh air.

Thermostats placed in the center of the cars, will provide an even temperature at all times, the thermometer contacts being so arranged that a rise or fall of two degrees in temperature will actuate the heater switch.

Thirty-six-watt frosted light globes will replace the old twenty-three-watt clear globes. These new globes, placed directly over the center line of each row of seats, will not only provide a better distribution of light, but will greatly improve the interior appearance of the cars.

Heaters of uniform capacity properly distributed throughout the cars will insure warmth in cold weather.

The application of "*Spring Grip*" weather strips to the window sash will eliminate rattling of windows, make them easier to open and close and keep out drafts.

SAFETY—HEALTH—COMFORT ATTRACTIVENESS

"Built-In Features" of Every Street Car

Building a Better Transportation System for a Greater Kansas City

KANSAS CITY PUBLIC SERVICE COMPANY

President

A Train Load of Materials Over 20 Miles Long

The sixteen track reconstruction jobs completed since October 16th, 1926, have required materials sufficient to fill a train over twenty miles long.

Think of it! 2,220 railroad carloads of ties, cement, sand, rails, crushed rock and other materials.

Yet the work has barely started. Thousands of more carloads of material will be required to consummate the enormous improvement program we are now carrying forward as rapidly as possible—to

BUILD A BETTER TRANSPORTATION SYSTEM FOR A GREATER KANSAS CITY

KANSAS CITY PUBLIC SERVICE COMPANY

President

$705,354 for Improvements!

That's the amount actually spent on *track work alone* since October 16, 1926. And yet this represents only a small part of the total amount we are to invest in Kansas City in the next three years.

Where New Track Has Been Built Since Oct. 16, 1926

Main Street
3rd to 9th Streets
Grand Avenue
20th to 27th Streets
Troost Avenue
15th to 37th Streets
State Line
Dodson Line
27th Street
Indiana to Cleveland Avenues
Southwest Boulevard
Main to 20th Streets
Ninth Street
Mulberry to State Line
Central Avenue
State Line to James Street
Chelsea Boulevard
8th to 18th Streets
Ruby Avenue
12th to 21st Streets

KANSAS CITY PUBLIC SERVICE COMPANY

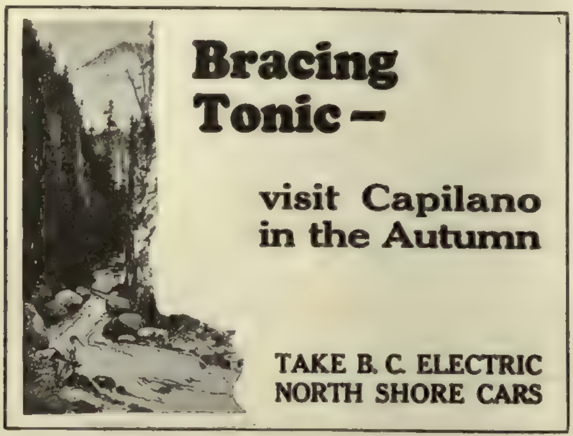
President

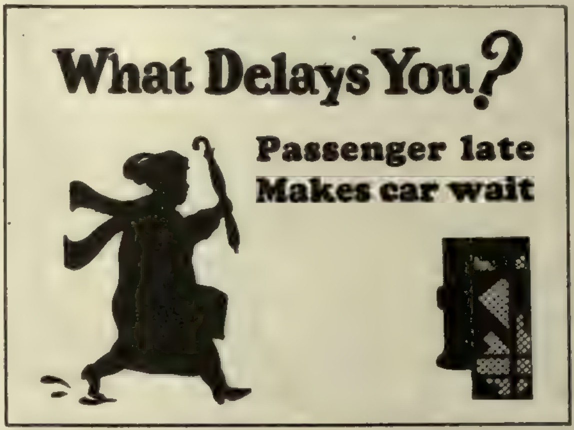
Display type and illustrations dominated the copy of the Kansas City Public Service Company in its campaign consisting of 18 display advertisements in newspapers. The series featured "the mutuality of interest between the community and its transportation system"

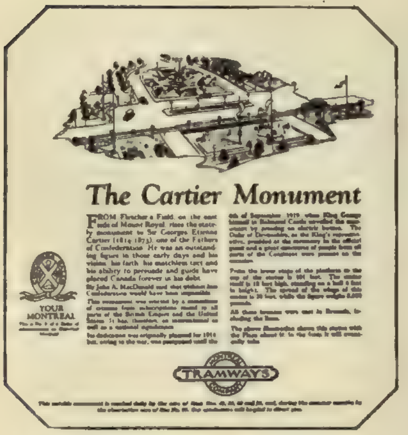
St. Helen's Island, Notre Dame de Lourdes, the Art Association, Historic Place Royale, the Hotel Dieu, Montreal's first hospital, the new courthouse, the Royal Victoria Hospital and the Université de Montréal. The period of a year was used to cover these and other points of interest, and, according to Colonel Hutcheson's foreword, the object of the campaign "was to awaken the interest of Montreal's citizens and also to furnish authentic and accurate information that would be appreciated by visitors to the city."

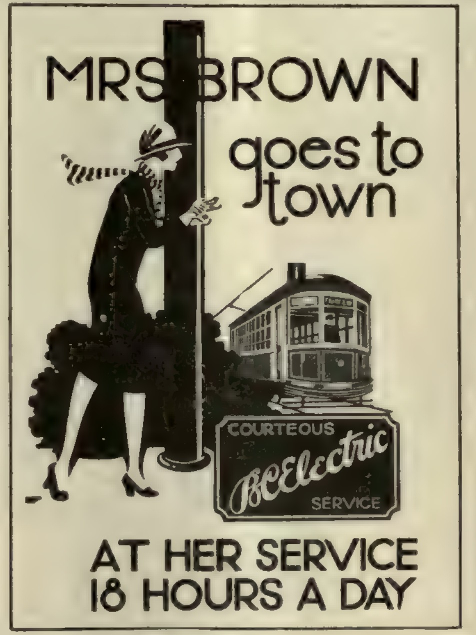
To the east of Montreal, the Cape Breton Electric Company, Ltd., Sydney, Nova Scotia, has been active in publicity matters, using the newspaper medium. While these advertisements are small, they cover all the up-to-the-minute selling points of modern transportation.

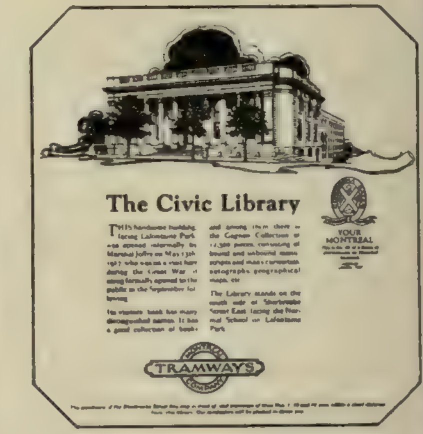
Another company beyond our northern border which is telling the public of the value of car and bus transportation is the British Columbia Electric Railway at Vancouver, B. C. Its publicity activities have been confined to 19x27-in. poster sheets, and 9½x12½-in. poster cards

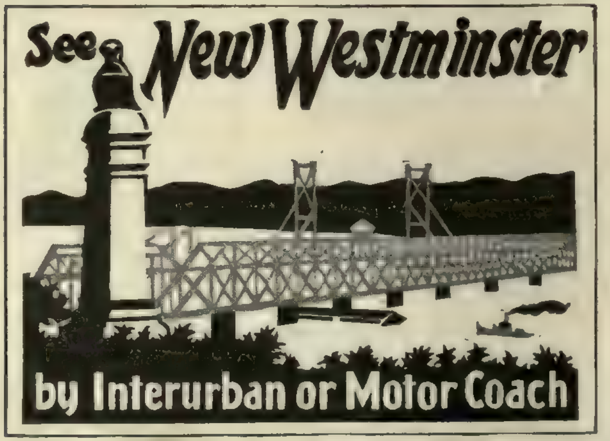

Bracing Tonic –
visit Capilano in the Autumn
TAKE B. C. ELECTRIC NORTH SHORE CARS

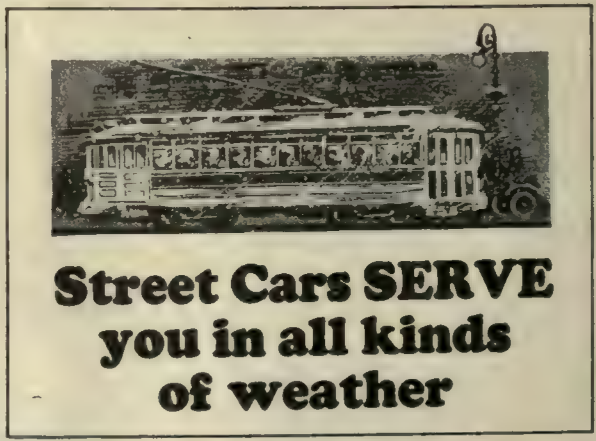









See New Westminster
by Interurban or Motor Coach


Street Cars SERVE you in all kinds of weather

Two Canadian companies that have advertised extensively are the British Columbia Electric Railway, Vancouver, B. C., and the Montreal Tramways. The two illustrations at the top, the two at the bottom and the one in the center are of posters prepared by the B. C. Electric. The other two are typical advertisements from a series of 28 featuring points of historic and general interest in and about Montreal and sheets. The large posters are done in several attractive colors, while the small sheets are a combination of solid color for a background with the message and illustrations in a contrasting color. Such a slogan as this adorns the posters: "What Delays You—Too Many Stops to a Mile?" This is illustrated with sketches of an open drawbridge, automobiles cutting in and running in front of cars, and late passengers running for cars. Besides stressing the causes for service interruption, the small posters have been effectively used to lure the public to the countryside around Vancouver, by means of coach, interurban and observation cars.

Lately, the New York State Railways, Rochester, N. Y., used the newspapers as a forum to discuss with the public, among other subjects, its reasons for asking for an increase in fares. Under the caption "We want you to know all the facts," six paragraphs in display type were used to present the argument. These were arranged in a space 6x12½ in. so as to leave ample white space and to attract instant attention. One paragraph announced that the company had prepared a series of statements "which will explain frankly and in detail the facts on which our appeal is based." The closing paragraph invited patrons to study the question in order that their intelligent co-operation could make for better service. Other ads detailed the necessity for adequate transportation service, under such captions as: "Where do you work?" "A Useful Citizen," "Suppose There Were No Street Cars" and "Just After the Whistle Blows."

These posters, conspicuous for their color combinations and "snappy" subjects, are from the Pittsburgh Railways, which advertises extensively

CLEAN PAINT PLANT UP
Your children are cleaning up Pittsburgh—They ask your help.
"Pride in one's property creates community pride"

OH BOY! the circus is coming
WEEKLY PASS
GO BY TROLLEY

Transportation problems in and around Buffalo were made known to the public in a series of posters prepared by the International Railway. "Thank you!" was the heading for one of these posters, which expressed appreciation to car riders on one line for their forbearance during the process of construction work. Another poster, issued in co-operation with the Buffalo Council of Churches, reads: "The test of a city's greatness is the kind of men it brings forth." On the back of this attention is called to the constructive civic advertising which was being run in the *Saturday Evening Post*.

Employing 25 letters of the alphabet to discuss its service from A to Z, the Long Island Railroad recently put on an extensive campaign in 107 Long Island newspapers, the advertisement appearing once a week in each paper. C. C. Pennington, assistant general passenger agent and advertising manager, was responsible for the unique copy. Commenting upon the effectiveness of this service, George Flotow, publicity agent, writes: "I think this type of advertising has had the important effect of giving the traveling public and general public on Long Island a better understanding of our problem. Several local papers have published favorable editorials on this series."

In make-up the ads left little to be desired. By the use of a large bold-face but lower case initial with smaller letters, also bold face, for the remaining letters of the key word of each ad, the main theme commanded the reader's instant attention. In keeping with the Websterian flavor of the series, under nearly all of the headings a definition from Webster was given. For instance, the first ad had as its theme "accessibility." Directly under this word was: "Easy of access—Webster." Key words in the campaign included "Betterments," "Confidence," "Efficiency," "Fairness," "History," "Knowledge," "Optimism," "Wages" and "Vision." In each case the ads occupied a space two columns by 7 in.

In line with its confrères in the States, Jamaica Public Service Company, Ltd., Kingston, B.W.I., has used the newspapers in appealing to investors in utilities stock, as well as for the purpose of selling car service and electric appliances. It also is using 16x24-in. stiff cardboard posters in its trams, dealing with safety and other subjects. Such slogans as "Ride the Trams, There Is an Organization Behind Our Service," "Careless People Take Short Cuts in Life," and "These Cars Carry 25,000 Passengers Daily," comprised the text. The lettering was in large capitals alternated in red and black ink. Christmas copy was especially effective from the standpoint of text and illustrations.

Turning to western Pennsylvania one discovers the Pittsburgh Railways pursuing its usual extensive co-operative publicity campaign in conjunction with civic organizations. Claiming first interest are the 18¾x26¾-in. posters, conspicuous for their color combinations and snappy items. For example, upon a lemon-yellow background is a charming red-headed flapper holding up a weekly pass. The caption reads: "Girls, 'tis leap year. Pick a winner." The lettering is in black and green, shaded with red, and the facsimile of the pass is made rather striking by using black letters on a white background. Less flamboyant, yet none the less attractive, was a poster used in connection with the recent International Art Exhibition at the Carnegie Museum. Here a graceful action picture of a Spanish dancer was employed to tell the story. The color scheme of rich browns and reds of the dancer's costume was contrasted effectively with an indigo blue background. Another striking poster of this class invited inspection of "Utility Hall," a model home of the Equitable Gas Company and Duquesne Light Company. The illustration and text were in white on a field of blue. Enticing color pictures of the same size have as their theme the beauties of spring and autumn in the country. In conjunction with the Western Pennsylvania Safety Council and Pittsburgh Chamber of Commerce a large poster in colors was issued in the interest of clean-up week.

Employee no-accident records also have been skillfully made use of in poster work. A large poster featuring the photographs of three motormen and giving the names and carhouses of twenty others, bore the caption: "These motormen had no accidents during the past year." Beneath the operators' names were statistics showing the decreases in accidents and accident costs over corresponding one-month periods. Following this was a detailed record of carhouses, enumerating the number of accidents, car-miles operated, settlements and verdicts, cost per 1,000 car-miles and accidents per 10,000 miles operated, the latter being the basis of comparison. The statement was signed "Your Central Safety Committee."

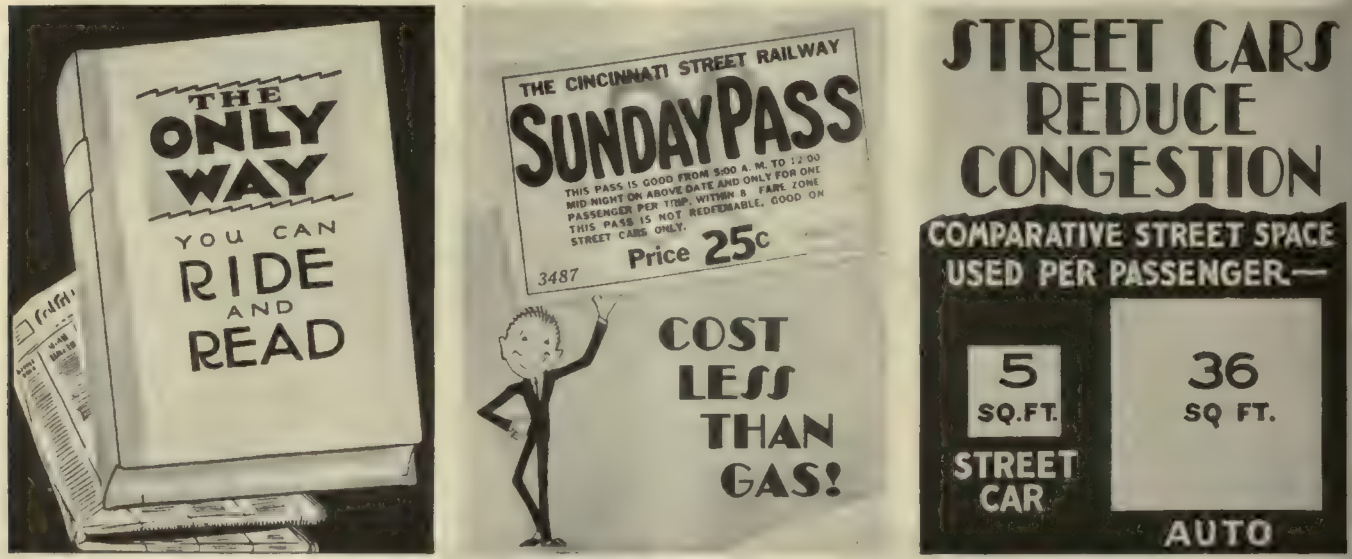
Civic pride combined with civic achievements have largely influenced the text matter which the Pittsburgh company has placed on its 7x15½-in. end rack cards. In one year 135 different examples of text were used. Each card was kept in approximately 1,400 cars and trailers, in daily service, for a period of seven to fifteen days and was viewed by almost 400,000,000 patrons during the year. A handy booklet giving the text of 311 end rack messages has been distributed to the industry.

As examples of promoting community and civic interest the following messages are typical: "Pittsburgh Has the Largest Tube and Pipe Mill and the Largest Structural Steel Plant in the World" and "Greater Pittsburgh's Power Plants Produce More Electric Power than the American Niagara Falls." Of diversified interest are such slogans as "To Keep Out of the Crowds, Shop From 10 Until 4," "Ah, Madame, Shopping via Weekly Pass is So Pleasant" and "Pedestrians Should Be Seen and Not Hurt." Another good example is this clever jingle:

> I always take a street car
> Whene'er I go to market;
> 'Cause when I take a trolley
> I never have to park it.

In addition to these mediums, effective publicity is secured through *The Transit Guest,* a weekly publication. The company also issues *Trolley Travelog,* a comprehensive guide to the points of interest in and around the city.

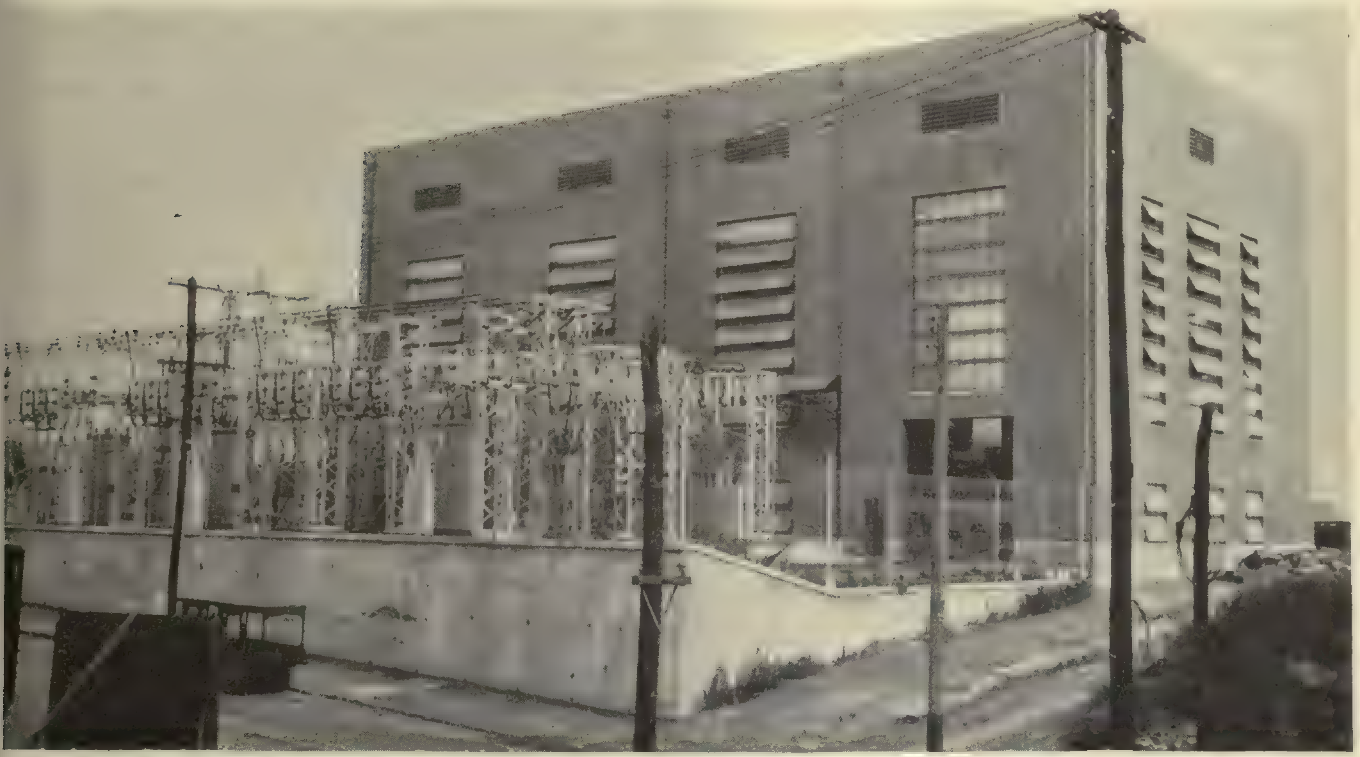
The Philadelphia Rapid Transit Company continues its publicity and advertising campaign with a diversity of subjects and illustrations. The cards displayed not only sell car rides but feature current civic events. For example, for the Penn-Notre Dame basket ball game last season this text was used: "The 'Four Horsemen' Against Traffic Congestion—Trolley, Bus, 'L' and Yellow Cab to Penn-Notre Dame Game." Many of these cards are cleverly illustrated. In design and spirit they reflect the city's historical atmosphere as well as its modern-day bustle and progressiveness.


THE ONLY WAY YOU CAN RIDE AND READ
THE CINCINNATI STREET RAILWAY
SUNDAY PASS
THIS PASS IS GOOD FROM 5:00 A.M. TO 12:00 MID NIGHT ON ABOVE DATE AND ONLY FOR ONE PASSENGER PER TRIP, WITHIN 8 FARE ZONE THIS PASS IS NOT REDEEMABLE. GOOD ON STREET CARS ONLY.
Price 25c
3487
COST LESS THAN GAS!
STREET CARS REDUCE CONGESTION
COMPARATIVE STREET SPACE USED PER PASSENGER—
5 SQ.FT.
STREET CAR
36 SQ FT.
AUTO

Large brightly-colored posters are used by the Cincinnati Street Railway to sell its service. These three, with varied subjects, are typical

Electrification Program at Philadelphia Gains Momentum

Extension of suburban railway electrification, including the Philadelphia to Wilmington division, requires additional power supply. New frequency changing station of 200,000 kw. ultimate capacity installed to carry additional load of electrified sections



The 60-cycle outdoor substation and the station building which will ultimately accommodate six frequency changing sets

EXPANSION and improvement of transportation facilities in Philadelphia and the surrounding territory have been necessitated by the continuous industrial growth of the district. The entire territory is served by three large steam railroad companies, two of which offer extensive service in suburban traffic. The need for improved schedules, faster service, increased comfort for the passengers and those living in the vicinity of the railroad, and lower operating costs, made electrification of the railroad inevitable. The Pennsylvania Railroad took the initial step and electrified its tracks of heaviest service, the Paoli and Chestnut Hill divisions. The other two railroads are making preparations for electrification in this district within the next few years.

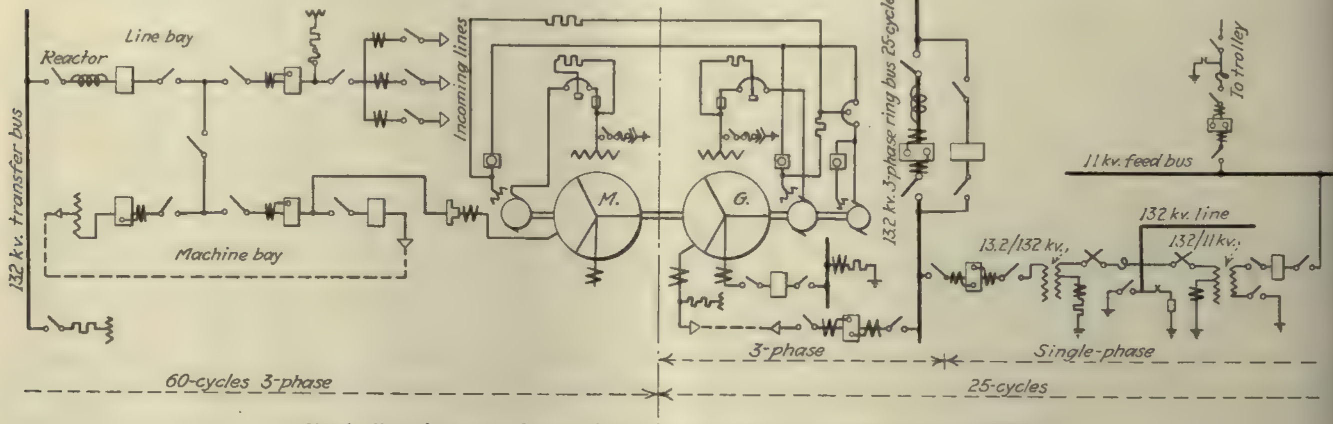
The Paoli and Chestnut Hill divisions of the Pennsylvania Railroad are fed from the Schuylkill steam plant, a part of a large interconnected power system. Electric power generated at 25 cycles, 13,200 volts is delivered through submarine cables to the Arsenal Bridge substation erected by the railroad across the Schuylkill River. At this point it is metered and passed through transformers which step up the voltage to 44,000 for single-phase transmission along the electrified tracks.

The present extension of the electrification, including the Maryland division between Philadelphia and Wilmington, demanded additional power and a point nearest the center of the new load was selected at Lamokin, in Chester, Pa., as the site for the new substation adjacent to the Pennsylvania Railroad tracks. Power at 60 cycles, three phase is received from the network of the Philadelphia Electric Company through underground cables. It is converted to 25 cycles, three phase through frequency changing sets and delivered from the terminals of the 25-cycle generators through underground cables to a three-phase outdoor ring bus. Single-phase transformers stepping the voltage from 13,200 to 132,000 distribute power to feeding stepdown substations by means of single-phase high-tension transmission circuits running along the railroad right-of-way. Each stepdown substation will transform to 11,000 volts for trolley-rail circuit.

Lamokin station is of the outdoor type with the exception of the frequency changing sets and operating room, which are housed in the station building. There is a railroad standard gage track and a broad gage transformer track on the outside of it passing through the yard and the station building on the lower floor to permit equipment to be hoisted to the upper floor by means of a 100-ton Niles crane, provided with a 10-ton auxiliary hoist. The property of the power company accommodates the 60-cycle outdoor substation and station building. The 25-cycle outdoor substation equipment is located on the adjacent plot belonging to the railroad. The ultimate development is to consist of six frequency changing sets, of which three were installed in the initial construction.

Special care has been taken to provide reliable source of feed for this substation. Power is delivered to each machine from the Chester steam plant through 350,000 circ.mil underground cables, each phase being carried by three single conductor cables. This arrangement was considered more advantageous than the use of one large conductor per phase because of greater flexibility and ease in handling the smaller cables.

The entire outdoor equipment is supported by a rugged steel structure consisting of two longitudinal sections made of standard structural steel. The outdoor substation consists of fifteen bays, of which one line and one machine bay act as a unit operating each frequency changing set. There are six double bays of that type to be installed. Of the remaining three bays two are to be used for switching equipment of two station light and power transformer banks, and one for bus sectionalizing equipment. The main conductors are 2½-in. I.P.S. copper tubing provided with grounding points in places where inspection and maintenance are necessary. The grounding of the outdoor substation consists of 2x¼-in. copper bus with taps taken to the columns, tanks, bases and frames of the outdoor equipment, each tap consisting of a 3x¼-in. copper bar. Galvanized iron pipes are driven on all corners of the substation and tied to the grounding network. These pipes terminate in boxes and the connection with the ground bus is made in a manner to facilitate testing. The two station light and power transformer banks are located south of the building, each consisting of two 150-kva. OISC transformers. The 60-cycle outdoor substation and station building are shown in an accompanying illustration.



Single line diagram of one of the three frequency changing sets installed

Quick Response Excitation for Frequency Changers

The station will ultimately accommodate six frequency changing aggregates, each consisting of a 60-cycle, three-phase, 13,200-volt, 300-r.p.m. synchronous motor, rated 18,000 kva., 90 per cent power factor, coupled with a 25-cycle, 13,200-volt generator, rated 30,700 kva., 70 per cent power factor lagging, single phase, and 15,000 kw. when used as a three-phase machine. Three of these units are used in the initial installation. The ultimate capacity of the station will take care of the entire power demand of the Wilmington-Philadelphia section when full electric service is installed.

Each foundation of a frequency changing set is supported on piling driven under all bearings, the piling being 15-in. iron pipe filled with reinforced concrete. The piling is connected to the general grounding system by means of standard rail bonds. Vibration may be expected due to the pulsating torque caused by the loading of only one phase of the generator. An expansion joint 1 in. wide is provided on the main floor level all around each unit to prevent vibration being transmitted beyond the machine's foundations. The armature frame of each motor is welded and can be shifted for the purpose of synchronizing. The 20-in. shaft of the machine is supported on four 20x40-in. standard bearings. Temperature exploring coils are imbedded in the stator and each machine is provided with two 2-in. brass manifolds that may be connected with adjacent water pipes for fire protection. Each machine has a sheet steel inclosure with ventilating openings in the upper part of the yoke. The exciter of the motor is mounted on the extension of the motor shaft and is rated 60-kw., 250-volt direct current. The generator has also a 135-kw. direct connected exciter with a 15-kw. (pilot) auxiliary exciter mounted on the extension of the main shaft.

The field air circuit breaker and rheostats are located on the main floor of the machine hall adjacent to the corresponding exciter. The auxiliary exciter feeds the field windings of the main exciters and has a 200-amp. 250-volt air circuit breaker in series. The main exciters, therefore, are separately excited machines while the auxiliary exciter is a shunt machine. The use of the auxiliary exciter eliminates the necessity of large main field rheostats and permits a quick response of excitation during short circuit disturbances and heavy load fluctuations.

The neutral leads of the generator, after passing through current transformers used for differential protection, are tied together and continued through a single-phase, 1,200-amp., 15,000-volt oil circuit breaker in series with 1,000-amp., 15,000-volt disconnecting switches. All neutral oil circuit breakers are tied to a neutral bus brought outside. This bus passing through a current transformer becomes grounded through a 4-ohm resistor rated at 2,000 amp. for one minute. This current transformer and three unit resistors are located along the south wall of the building in back of the station light and power transformer banks. The basement under the machine hall accommodates the instrument transformer compartments and auxiliary equipment, including a frame shifting motor and motor-driven oil pump for each machine, an oil purifier heated by an immersion electric heater with three heat control, a rotary oil pump and a 7x6-in. air compressor. Electrolytic lightning arresters with fuses and balancing resistors connected across the field of each machine are located in the basement on each machine foundation. A Cory interlock system is used on all outdoor switching equipment to prevent the opening of disconnecting switches under loads by unauthorized persons, or damage from the same cause through malicious tampering.

Switching Under Load on the Low Tension Side

The outdoor equipment of the railroad consists of a three-phase, 13,200-volt, 25-cycle ring bus, ultimately to be sectionalized in three parts or six sections. Each section is to be fed from a separate frequency changing set. The two middle sections feed one single-phase transformer while two-single phase transformers will be connected to each end section. The adjacent sections are tied by means of oil circuit breakers with reactors and disconnecting switches in series. There also will be a shunt tie having the same kind of equipment but no reactors. Each section is to have its potential transformers with fused resistors.

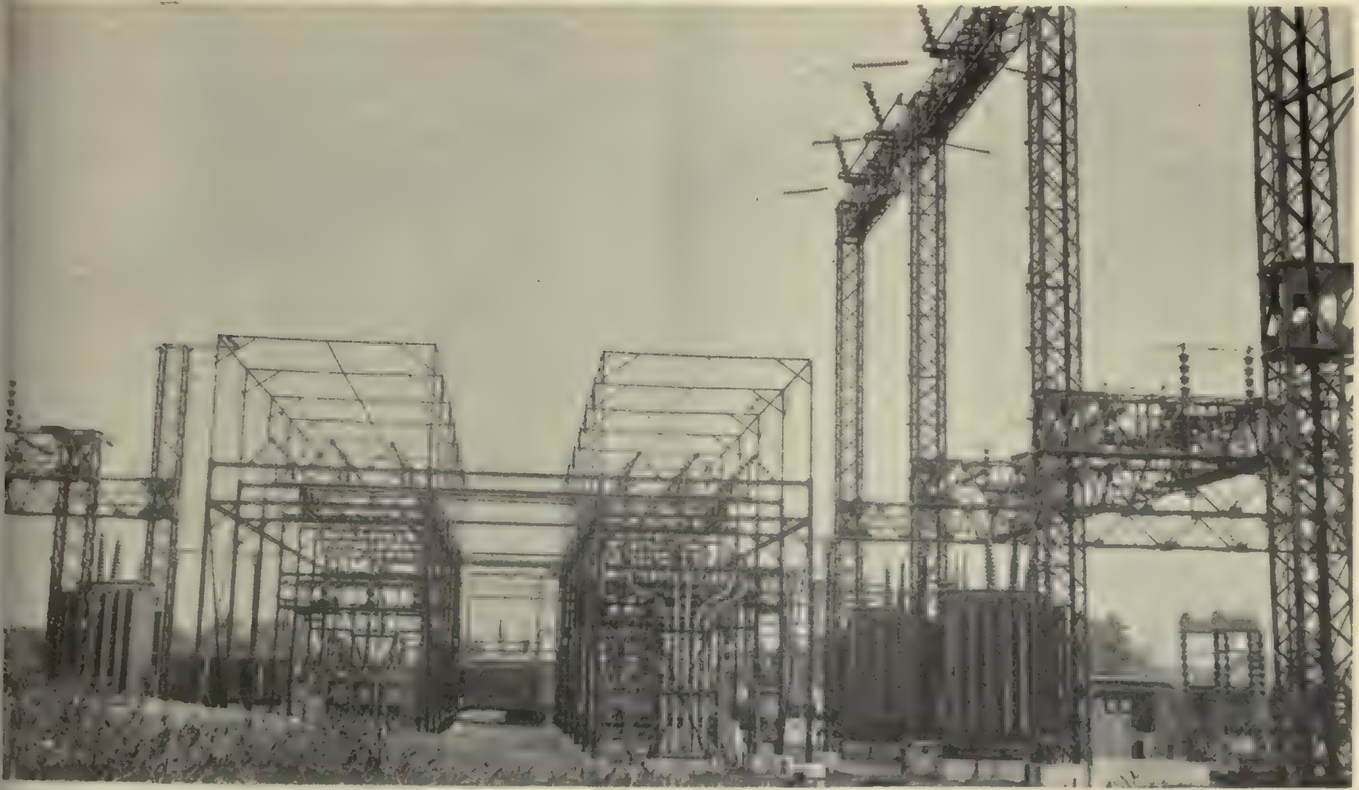
The low-tension side of the single-phase transformer connects to the 13,200-volt bus through an oil switch with disconnecting switches in series. The high-tension winding of this transformer steps up the potential to 132,000 volts, having the middle point of the winding grounded through a resistor located outdoors under the high-tension switching structure.

The high-tension structure carries the 132,000-volt line air current breakers, choke coils and lightning arresters. A tap is taken from the high line to a single-phase transformer stepping down to 11 kw. for feeding the contact wires of the local section of tracks. Only that part of the outdoor equipment which is directly tied into the 13,200-volt, three-phase bus is controlled from the two 25-cycle switchboards located in the operating room. All the secondary control wires from the bushing type current transformers and from the potential transformers in the outdoor substation are brought directly to the pipe room under the 25-cycle board, or indirectly when passing previously under the 60-cycle control boards. Such indirect routing of cables was caused by the duplication of ammeters connected in series on both instrument boards.

The initial installation is to consist of three-bus sections sectionalized with no shunt ties, each section being fed from an individual generator.

All secondary control cables are brought in iron conduits to the pipe room located directly under the operating room. A steel frame is built in the pipe room under each switchboard to carry connection boxes for the pipes, auxiliary panels for fuses, cutouts, secondary relays and other equipment of the secondary control circuits. All pipes carrying d.c. control leads are brought under the relay board, and those carrying a.c. secondary leads terminate in boxes under the instrument board. The intermediate and cross connections between the boards are made in pipes running under the pipe room floor or overhead.

The 60-cycle control boards are of a circular type centrally located in the operating room. This arrangement requires a fanlike steel structure to permit the passing of control pipes from the pipe room to the switchboards. To avoid an excessively heavy structure the operating room floor was not made entirely self-supporting, part of the load being taken by three columns in the



The outdoor equipment of the railroad includes a 13,200-volt, 25-cycle ring bus which will ultimately be sectionalized in three parts

pipe room. The benchboard is centrally located in the operating room, and concentrically in relation to it is the instrument board, with the relay board back of it. The station light and power board and the d.c. board are to the right side facing the circular boards, and to the left is the 25-cycle instrument board with the relay board back of it. The remaining part of the floor space in back of the station light and power board is occupied by the railroad signal equipment, consisting of two motor generator sets with switching equipment for generating 440-volt, 100-cycle, single-phase current. Each set consists of a 75-hp., 60-cycle, three-phase motor using 2,300 volts from the station light and power two-phase, 220-volt circuit, transformed to 2,300 volt, three phase by means of a bank of two 37½-kva. single-phase transformers per machine. These transformers are located outdoors in the railroad switchyard.

A Lundin and flash test panel is located in the basement to facilitate testing of cables. Two motor generator sets are installed on the operating floor level for generating direct current and feeding the two storage batteries. Two battery rooms are provided in the basement, only one being equipped for the initial installation. The 25-cycle control and relay boards accommodate all meters and protective apparatus necessary for outdoor bus and transformer equipment, and a duplicate control is provided for the generator oil circuit breakers. These breakers can therefore be tripped from both boards while the closing can be made only from the circular board. All high-tension 132,000-volt switching equipment is controlled from a switchhouse located on the railroad premises.

Ground Resistors Have Relay Protection

This station, acting as a link between the highly fluctuating railway loads and the immense source of power of the Philadelphia Electric System, must have an adequate and reliable relay system. Electric instruments, therefore, must be interposed between the main circuit or apparatus and the current breakers in such a way that any abnormality in the circuit will act on the relays. These in turn, after proper discrimination as to the magnitude and character of the fault, cause the circuit breaker to trip, thus relieving or protecting the circuit or apparatus.

In deciding upon the type of protection two important factors must be kept in view: The protection against interruption and the apparatus protection. The service protection requires an automatic sectionalizing of equipment in the station, so as to isolate the disabled section without disturbing the normal régime of all the remaining equipment.

The 60-cycle equipment is protected by type CO overcurrent relays actuated from bushing-type current transformers located on the incoming power side of the running oil circuit breaker. The secondary control current passes through auxiliary HG relays used for tripping the running oil circuit breaker, the field air breaker, and for operating the alarm and auxiliary circuits. Each motor also has a differential protection consisting of PQ type relays actuated by current transformers located in the line compartments of the machine hall. The d.c. control circuit of these relays actuates a special hand reset, multiple contact, auxiliary relay, tripping the running oil switch and the field breaker, and operating the annunciating system. The necessary hand resetting of this auxiliary relay prevents the operator from an immediate reclosing of the starting and running oil circuit breakers, thereby inducing him to investigate the cause of trouble previous to reclosing the breakers.

The tripping of the differential or overload relays of the motor does not cause cutting the generator loose from the ring bus. Under those conditions the machine will continue running from the 25-cycle side, providing the adjacent 25-cycle bus sectionalizing switch is closed. The unit will be started anew if tripped by the overload relays, or shut down by the operator when tripped by the differential relays.

In the initial installation the station will be operated on the unit basis, each machine being fed separately from the generating station. In the ultimate installation each incoming line will have power directional relays actuated by bushing-type current transformers in the line oil circuit breakers. Provision also is made for overcurrent protection of the magnetizing switch, three-phase type

The high-tension structure carries the 132,000-volt line air circuit breakers, choke coils and lightning arresters

COA relay being used for compactness instead of three single-phase relays.

The protection of the generator is entirely independent from the protection of the motor. It also has overload and differential relays working in a manner similar to that of the motor except that the exciter field breaker is not tripped simultaneously with the machine oil circuit breaker.

The protection of the single-phase 13,200 to 132,000 volts step-up transformers is accomplished by means of differential type MC relays operating the transformer oil circuit breaker, and actuated by bushing-type current transformers in the breaker and the power transformer. The outgoing high-tension lines are protected by type CO overcurrent relays actuated from bushing-type current transformers on the high-voltage leads. The line also has a ground protection by means of an overcurrent relay, type CO, actuated by a current transformer in the grounded middle point lead. This middle point of the high-tension winding is grounded through a 330-ohm outdoor type resistor, protected by an overcurrent type CO relay connected in series with the ground relay. Bus differential relays, type MC, are used for protection of the bus, and are actuated by bushing-type current transformers on the incoming side of the generator oil switch and the outgoing side of the bus and transformer oil circuit breakers.

The 132,000-volt air circuit breakers are controlled from the control house on the railroad premises. The control circuits of these breakers and the oil switches are interlocked by means of auxiliary d.c. relays to insure the opening of the air breakers upon the action of the differential resistor protecting relays. The ground resistor relay has a logarithmic characteristic and becomes energized whenever the ground current of the line is not sufficiently high to actuate the ground relay yet sustained and high enough to cause damage to the resistor.

The design and installation of converting and distributing equipment for the Pennsylvania Railroad was in charge of Gibbs & Hill, consulting engineers of New York City.

◆

Parking Prohibited After Snow Storms

DEFENSE DE STATIONNER
La neige
doit être enlevée des rues où circulent les trams.
NEIGE-SNOW
NO PARKING
Snow
to be removed from tramway streets.

Dash sign carried on Montreal cars to warn motorists against parking during and after snow storms

UNDER agreement with the city of Montreal, the Montreal Tramways pays 50 per cent of the cost of snow removal from "tramway streets." This expense to the company is in addition to the ordinary broom and short wing work done by snow sweeper equipment. Before automobile parking interfered, the tramways' equipment winged the snow out to a "windrow" alongside the track, after which city equipment piled the snow near the curb, from whence it was removed. During the past few years, however, automobiles parked at curbs during and after storms, have interfered greatly with the use of long wings on the tramways' equipment, as well as street cleaning operations, thus increasing the cost of snow removal. In many instances, after storms, moving vehicles made such use of the space cleaned by sweeper equipment as to cause serious delay to street car traffic.

In December last the situation was discussed at a conference between officials of the roadway department of the city and officials of the company. The result of this conference was that the chief of police was authorized (under existing city by-laws) to prohibit parking on "tramway streets" and bus routes, during and after a snow storm, when requested by the roadways department to do so.

In order to aid the city in notification of such a prohibition, the tramways agreed to carry "No Parking" signs in the street cars, and display them on the front or rear of the car, on notice from the city.

◆

Magnitude of German Street Railways

STATISTICS of German street railways are given in the latest handbook of German street railways, light railways (interurban lines) and private railways, published by *Verkehrstechnik* for the Verbandes Deutscher Verkehrrswaltungen, formerly the Association of German Street Railways, Light Railways and Private Railways. A total of 182 street railways, 309 light railways (of which 34 are electrically operated) and 128 private railways are listed, which together have a working length of 20,864 km. (12,957 miles). The capital invested is 2.8 billion marks ($666,000,000). In the latest year for which reports were received 154,681 persons were employed, 4.66 billions of passengers were carried and 86.4 million tons of goods were dispatched. Some of the most interesting figures are given in the accompanying tables.

TABLE I—GERMAN STREET RAILWAYS MORE THAN 100 KM. (62 MILES) OPERATING LENGTH

	Km.	Miles
Berlin Street Railway System	615.0	381.3
Hamburg Street Railway	217.3	134.7
Rhenish Railway of Dusseldorf	172.0	106.6
Street Railway of Hanover	166.9	103.5
Aix-la-Chapelle Light Railway (25 km. additional in the Eupen district sequestrated)	152.1	94.3
Dortmund Street Railways	150.2	93.1
Municipal Railway of Dresden	139.8	86.6
Greater Leipzig Street Railway	128.8	79.8
Bochum-Gelsenkirch Street Railways	125.6	77.9
Street and Vorort Railway of Cologne	115.7	71.7
Municipal Street Railways of Munich	110.1	68.3

TABLE II—GERMAN STREET AND INTERURBAN RAILWAYS, CLASSIFIED BY LENGTH

Length		Number of Railways		
Km.	Miles	Street Railways	Interurbans	Total
Under 3	Under 2	13	1	14
3– 10	2– 6	43	12	55
10– 20	6–12	51	10	61
20– 30	12–19	12	6	18
30– 40	19–25	12	2	14
40– 50	25–31	15	0	15
50– 60	31–37	7	1	8
60– 70	37–43	3	2	5
70– 80	43–50	4	0	4
80– 90	50–56	1	0	1
90–100	56–62	3	0	3
Over 100	Over 62	13	0	13
Length not stated		3	0	3
		180	34	214

TABLE III—NUMBER OF PASSENGERS CARRIED BY LEADING GERMAN STREET RAILWAY SYSTEMS

Berlin surface lines	834,701,449
Hamburg	335,272,342
Berlin elevated	222,530,000
Cologne	222,103,908
Dresden	201,146,742
Munich	166,806,096
Leipzig	159,224,496
Frankfort-on-Main	143,622,050
Dusseldorf	139,684,449
Breslau	125,987,832
Stuttgart	121,154,314
Essen	84,690,830
Hanover	76,192,180
Bremen	70,152,167
Dortmund	69,351,698
Chemnitz	50,924,848
Magdeburg	49,665,946
Bochum	44,949,126
Karlsruhe	40,526,449
Mannheim	39,409,543
Konigsburg	38,938,926
Halle	38,595,178
Stettin	32,805,116
Duisburg	30,817,066
Dantzic	30,768,111
Aix-la-Chapelle	29,770,847
Kiel	25,499,731

The architectural treatment of this new garage of the El Paso Electric Company makes the building distinctive

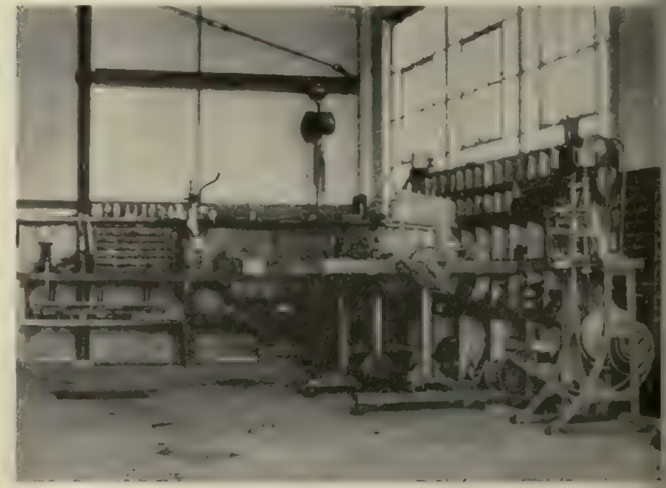
Attractive Garage Houses El Paso Buses

Well lighted and ventilated building used for storing, inspecting, servicing and washing the buses. Repair shop completely equipped

BUSES of the El Paso Electric Company, El Paso, Tex., are now quartered in an attractive new garage, equipped for servicing and repairing the buses, as well as storing them. The building is of steel and brick construction, with inner walls of steel lath and plaster, concrete floors and gypsum roof. Steel sash running the entire length of the outer walls permit an abundance of natural light to enter and also provide ample ventilation.

The main part of the garage, used for bus storage, inspection, servicing and washing, is 50x80 ft. This room is entirely open at both ends but can be closed tightly by means of sliding doors. There is a large skylight in the center of the roof. The inspection pit is long enough to accommodate two buses at a time, and is illuminated by electric lights set in depressions in the walls. There are a number of sewer drains in the floor to take care of bus washing.

The shop is located in a room 20x40 ft., and is adequately equipped for all repairs. It has two 2-ton chain block hoists, which travel on overhead beams, for lifting the bus bodies, and a jib crane with a $\frac{1}{2}$-ton chain block hoist for handling the motors. There is a motor stand for holding the motors while they are being repaired or



The repair shop is equipped with two 2-ton chain block hoists, a jib crane and all necessary machines and tools

Main part of the garage where the buses are stored and serviced verhauled, and located in one corner of the shop is an ir compressor with a storage tank 2 ft. in diameter and 7½ ft. long. The air-supply system is connected to the torage tank in the carhouse by a pipe running under he street. Other equipment in the shop includes a main bearing and connecting rod bearing boring machine, a valve refacing machine, a drill press, a bench grinder and a brake lining machine.

Four 110-gal. oil tanks with pumps are used for storing the motor oils. The buses are fueled at two gasoline pumps, one at the front and one at the rear of the garage. Each pump is connected to a 1,000-gal. storage tank.

Two rooms in the northwest corner of the garage serve as offices for the master mechanic and his clerk. A locker room and lavatory, equipped with showers, also is located in the building. Hot water is furnished by an automatic electric heater. The building itself is heated throughout by steam radiators. Both the heating plant and the electric water heater are in the basement.

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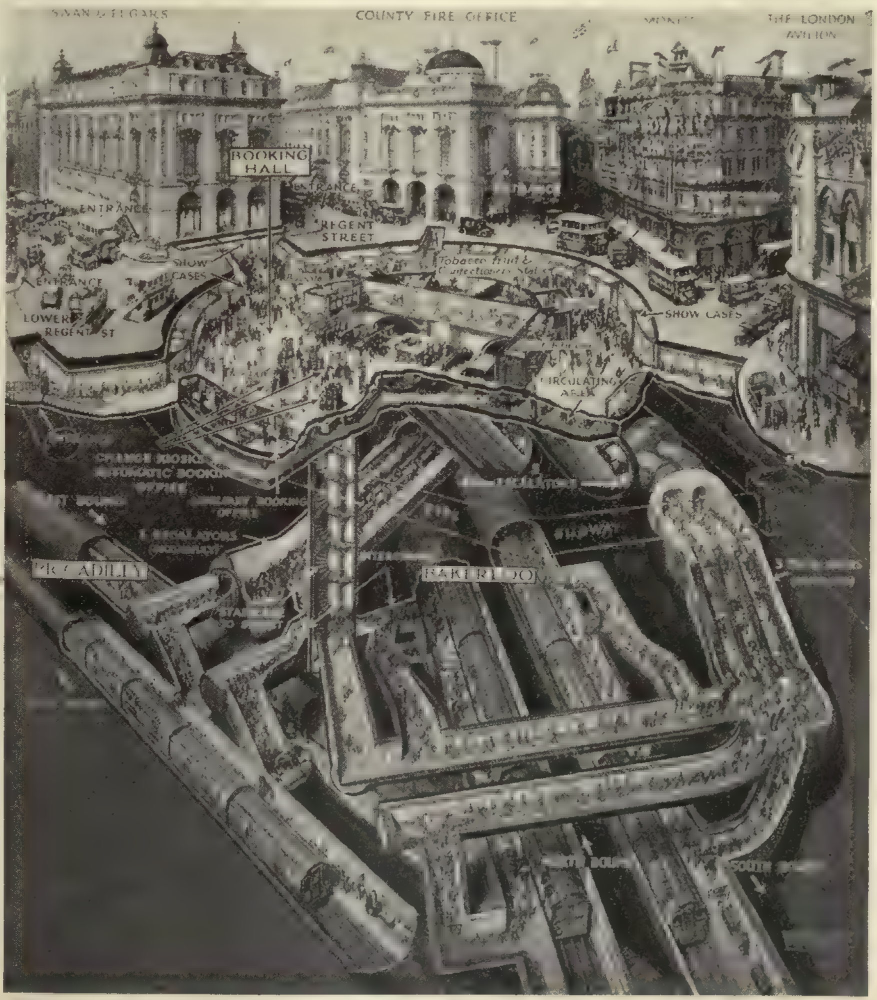
London Underground Completes Extensive Station at Piccadilly Circus

It serves two tubes and has a capacity of 50,000,000 passengers a year. All excavation and construction material had to be conducted through one 18-ft. shaft

LONDON'S new and extensive underground passenger station has just been completed at Piccadilly Circus at the junction of two tubes, the Piccadilly tube and the Bakerloo tube. The original station at this junction dates from 1906, when the two tubes which cross each other at this point were opened. At the time it was built, this station seemed adequate to meet the requirements for many years to come, as it had to deal at that time with an annual traffic of only 1,500,000 passengers. Since then Piccadilly Circus has become a busy commercial center, being close to the retail shopping and theater districts of London. In consequence, the traffic at this station has grown until 25,000,000 passengers now pass through its portals annually.

When it became evident ten years ago that the old station was becoming inadequate, the new one was planned, and the last four years have been devoted to its construction. The public opening took place on Dec. 10, 1928, with appropriate ceremonies and was attended by a large gathering of distinguished guests. The cost of the new station was more than £500,000 ($2,500,000).



The latest tube station to be opened in London is at Piccadilly Circus, a congested traffic center. Four years were required in its construction and its cost was about $2,500,000

It connects the Piccadilly tube, 102 ft. below the ground, with the Bakerloo tube, 86 ft. below the ground, and it provides entrance and exit to the platforms of both tubes by passageways and escalators. Owing to the necessity of keeping obstructions on the streets at a minimum during the work of construction and thus permit a constant movement of traffic, the engineering problems were complicated. An important factor in making them so was the need also not to disturb the services supplied by the gas, electric light, telephone, water and hydraulic power mains running in all directions immediately below the roadway. To complicate the problem further, a large sewer passed directly through the projected location of the main ticket office.

After the engineering drawings had been prepared, the custom was followed, as has been done with previous new underground stations, of preparing full sized models of the various levels so as to experiment with them and thus obtain the most satisfactory arrangement. In the case of this station, the models were built up with scaffold poles, cardboard and other pliable material, and the layout was arranged and rearranged and submitted to various tests until finally the most suitable scheme with respect to the position of escalators, landings, passageways and other features was produced. These tests were carried on at a place where covered accommodation was available for setting up a full sized plan of the main ticket office.

When work was actually begun on construction, excavation was conducted through a small "island" near the center of the area on which a monument stood. This was removed for safekeeping, and a shaft, 18 ft. in diameter and 92 ft. in depth, was sunk at this point. Through this shaft, the construction of all of the work with the exception of the main entrance and ticket office was carried out. This shaft was also used for the passage of materials, equipment, etc., to and from the work and for bringing spoil up to the surface. Fortunately the subsoil was suited to make construction fairly easy. It consisted largely of clay, with an overlay of gravel near the surface. Water was not, therefore, encountered to any extent, so that it was not necessary to build coffer dams or to work in compressed air.

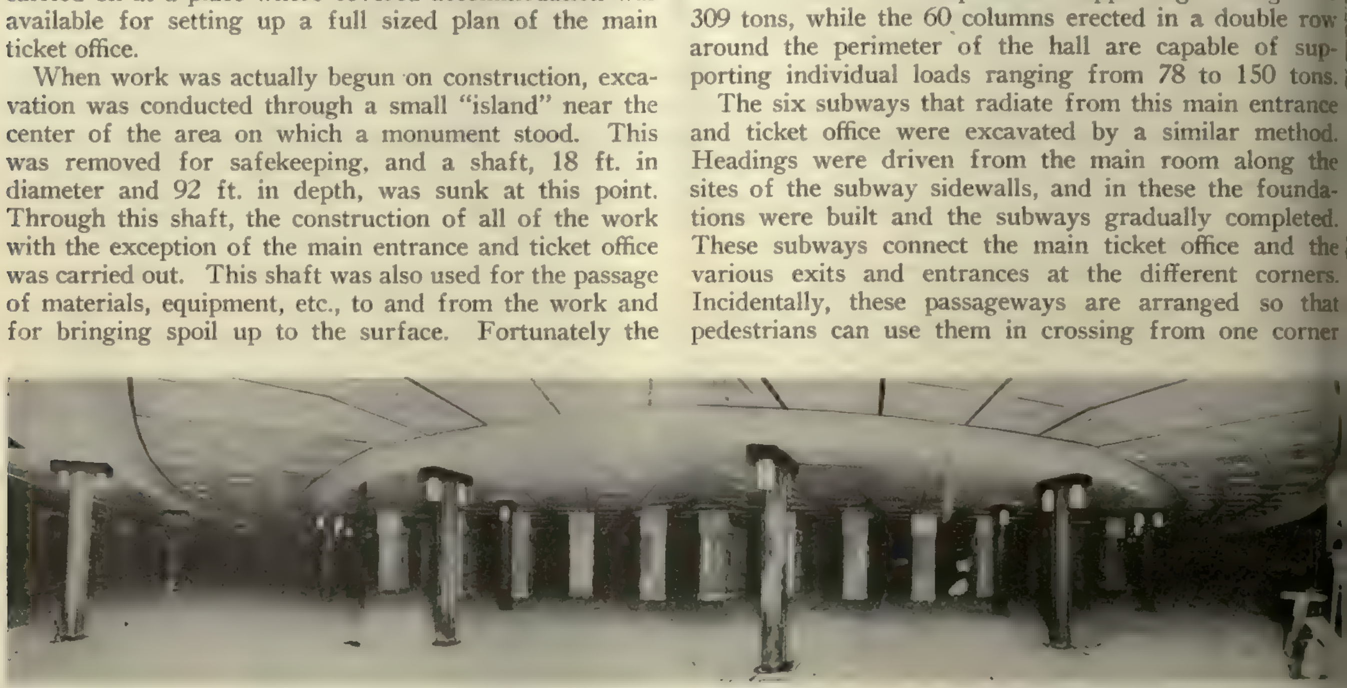
After the shaft was sunk, the next procedure was to drive headings or tunnels at various depths. Before actual work could be begun on the station and its passageways, however, a special subway had to be built to carry the water, electric light and other mains which underran this area. This pipe subway is 12 ft. in diameter, or 3¾ in. larger than the railway tubes. It is of similar design, being of circular section and lined with cast-iron segments. Herein it differs from pipe subways constructed elsewhere in London, as they have been of square or arched section and brick built. This pipe subway extends around the Circus at a depth of from 18 to 30 ft. below the surface, and forms a sort of outer circle to the station. It is 550 ft. in length, but instead of being level throughout its course, it has frequent undulations, so that it may pass above or below obstructions that lie in the path. Inclined tunnels having a total length of 300 ft. lead from this subway to the streets around it.

When the pipe subway was finished, the various conduits, cables, etc., were placed in it. They are now quite readily accessible, and henceforth any work concerned with them can be conducted without the former necessity of opening the roadway and hindering traffic.

The most difficult part of the work was the construction of the main ticket office, as none of the streets overhead could be blocked or opened up while the work was proceeding. This task was achieved by a series of methodical burrowings, until the ground below the surface became a labyrinth of steel roofed and steel supported tunnels. Then, through the removal of the intermediate walls of earth, an elliptical chamber, 155x144 ft. in area and 9 ft. in height, was opened up only a few feet below the surface. The permanent steel work was then put in place.

Each of the four columns erected in the central portion of this floor is capable of supporting a weight of 309 tons, while the 60 columns erected in a double row around the perimeter of the hall are capable of supporting individual loads ranging from 78 to 150 tons.

The six subways that radiate from this main entrance and ticket office were excavated by a similar method. Headings were driven from the main room along the sites of the subway sidewalls, and in these the foundations were built and the subways gradually completed. These subways connect the main ticket office and the various exits and entrances at the different corners. Incidentally, these passageways are arranged so that pedestrians can use them in crossing from one corner to another without buying a railroad ticket. Hence, the station is a public convenience also.



This large circulating area is only 2 ft. underneath one of the busiest traffic centers in London

Owing to the depth of the platforms below the surface of the street, it was necessary to divide the escalators into upper and lower flights. In all there are eleven escalators, the greatest number in any London underground station, and the five in the upper flights are the largest number yet installed side by side. All have a speed of 100 ft. per minute.

An average of about 150 men were constantly engaged during the four years that were occupied in the construction of the station and its appurtenant work.

The greater part of the main ticket office is finished in travertin marble and presents a handsome appearance. The flooring is of large white tiles, each 1 ft. square. The decorations include some paintings in oil along the inner side of the headwall of the escalators. The central compartment contains a map of the world, showing the British Empire in a distinctive color. Backing this map are smaller panels with pictures representing the activities of the Underground in the sphere of urban and suburban transport.

The tiling of the public subways is of biscuit color, relieved by black borders. The lighting is by lamps of opal shade.

Following the recent practice of the company, a large part of the ticket sales will be by automatic machines. The latest types are arranged to print the tickets as well as deliver them. Twenty-six of these machines are arranged around the ticket office. As the zone system is used, they issue tickets ranging from 1 penny to 6 pence in denomination. There is also an automatic change-making machine.

Pacific Coast Executives Hold Regional Conference

First of series of meetings to be held in various sections of the country under the auspices of the Advisory Council inspires frank discussion of current problems and outlook for industry

During two busy days, on Feb. 27 and 28, 1929, executives of electric railway properties in the Far West met in San Francisco for an informal and frank discussion of problems of policy and operation and for a comparison of views with respect to the outlook for the industry. The meeting, which was held under the auspices of the Advisory Council of the American Electric Railway Association, was well attended by principal executives representing electric railway companies along the entire Pacific Coast from Portland to San Diego and eastward to the Rocky Mountains. J. N. Shannahan, chairman of the Advisory Council, presided.

In opening the meeting Mr. Shannahan announced that this was the first of a series of regional conferences of principal local transportation executives to be held in various sections of the country for an intimate discussion of regional problems of mutual interest. He expressed a firm conviction of the basic need for organized community transportation service in modern cities, and pointed out that such service must be put on a sound and profitable basis before new capital can be expected to flow in to permit transportation service to keep pace with growing community requirements.

TRANSPORTATION VITAL TO COMMUNITY PROGRESS

"The public has a vital interest in the local transportation problem of the country," said Mr. Shannahan. "The very existence of modern cities as we know them today depends upon the maintenance and expansion of efficient public transportation service. To accomplish this, these properties must earn more than merely enough to pay fixed charges and operating expenses. The public must be brought to recognize this situation and to understand its own interest in the continuation and development of efficient community transportation." Mr. Shannahan expressed the belief that the public can be brought to recognize the facts of the transportation situation and to deal fairly with them, by outlining briefly his experience in Omaha during the effort to obtain an equitable franchise there, following a long drawn-out controversy and a previous popular defeat of almost the same franchise that was recently passed by a vote of almost 4 to 1.

In discussing the purposes of the conference and the outlook for the industry, L. S. Storrs, managing director American Electric Railway Association, directed attention to the striking similarity of the problems faced by various companies throughout the country. Each property, however, explained Mr. Storrs, is inclined to consider its own problems to be individual and special. To this point of view he attributed the apparent inertia on the part of individual managements in applying the methods which have proved successful on other railways. Mr. Storrs indicated that it was to help in overcoming this inertia that the plan of holding a series of regional conferences among the principal executives of operating companies in the several sections of the country was suggested.

Paul Shoup, president Southern Pacific Railroad and member of the Advisory Council, expressed the belief that the transportation industry of the country has made progress toward better public understanding of its problems. He felt that the American public may be expected to deal fairly with a question upon which it is properly informed and that it can be interested in the facts of the transportation situation if they are properly presented.

PROBLEM OF CONGESTION PRESENTS OPPORTUNITY

"The public, however, is not interested in other people's troubles," warned Mr. Shoup. With respect to the growing traffic congestion arising from the widespread use of automobiles, Mr. Shoup felt that the increasing difficulties encountered by modern communities as the result of congestion may be expected to react to the benefit of public transportation companies provided that equipment and service improvements are developed to take advantage of the opportunities presented. He held that the adequate development of efficient public transportation offers American cities a solution of the problem of congestion that has assumed extremely severe proportions in practically every large community.

As the discussion progressed, speakers dealt with various details of management and operation, but there was a persistent effort to keep in the forefront broad questions of principle and policy dealing particularly with fundamental economics and the relation between transportation and community development. "The local transportation industry," declared Samuel Kahn, president Market Street Railway, San Francisco, "presents three broad questions that are fundamental in any business enterprise. First of these is that of the right to do business; second, is the question of the right to earn a fair return on the investment, which shall be adequate to attract capital for improvements and expansion. Finally, and equally important, is the question of ability to earn an adequate return even after the right to do so is not an issue."

Mr. Kahn agreed with previous speakers that the current problems of many properties are common and similar in general terms. He held, however, that each property presents many special problems and pointed to the menace of municipal ownership propaganda as a basic question of particular importance in the Pacific Coast region.

Importance of Personal Leadership Stressed

Chairman Shannahan stressed the importance of personal leadership as a factor in the success of all American business today. "The growing size and complexity of business organizations have increased rather than decreased the importance of that single individual who furnishes the vision to plot a course through the shoals of unsound economic methods, and the inspiration to build esprit de corps in a vast organization frequently spread throughout the country or the world," declared Mr. Shannahan. "In each great business enterprise characterizing this modern industrial era, there is always one dominant personality that provides inspiration and leadership. Bankers recognize the importance of the man at the top in business success. In this respect the electric railway industry is no exception, and there is great need for leadership in the solution of its problems.

"Conferences of principal executives for the discussion of policies are of importance to the entire industry and to the future of each individual property," continued Mr. Shannahan. "The local transportation industry must look for its rejuvenation and advancement to the general recognition and application of sound economic principles. Many of the industry's past and present difficulties are attributable to its readiness to grasp at unsound expedients and its failure to recognize dangerous policies that were followed during the promotional and competitive stage of its development. In large measure, the continuing difficulties that have existed since the war are attributable to the industry's failure to dig below the surface of daily operating routine and to establish clearly the principles upon which the rehabilitated structure of community transportation must be reared. Great harm is done whenever an individual property adopts an unsound expedient in the attempt to work out its own salvation. For that reason, conferences among principle executives are vitally important in order that unsound policies may be avoided and the entire industry may be united in its advocacy of the principles upon which the complex economic problems of community transportation may be worked out."

At the request of Chairman Shannahan, Charles Gordon, editor Electric Railway Journal, discussed the general outlook for the industry and some of the factors involved in putting the local transportation business on a really satisfactory financial basis. "After all," said Mr. Gordon, "there is only one great basic question with respect to the local transportation industry, and that is whether or not any combination of rates and service can be devised which will satisfy the public on the one hand and, on the other, produce a satisfactory return for investors."

General Improvement in Basic Conditions

The speaker pointed out that there has been more progress in rebuilding the foundations of the industry than is apparent from a close-up view of daily operating results. In three principal respects, he held, there has been marked underlying improvement, extending to many properties throughout the country. First, in respect to franchises, former grants with arbitrarily fixed terms and conditions have given way in many cities to documents sufficiently flexible in their provisions to permit changing conditions and requirements to be met as they arise. Most notable among the characteristics of modern franchises are those of the indeterminate type as to duration, and service at cost as to rates. Only a casual survey is needed, according to the speaker, to give an impressive perspective of the extent to which modernized franchises have replaced the former type of rigid, fixed-term grants that were largely responsible for the serious difficulties into which the industry was plunged during the war and post-war period.

Next, but by no means secondary in importance, according to Mr. Gordon, is the vast improvement that has been made in the relations between local transportation companies and the public they serve. In city after city, as the past decade is reviewed, a condition of suspicion and unfriendliness on the part of the public, and dogged, stubborn combativeness on the part of railway managements has been replaced by cordial relations and a mutual effort toward co-operation. In many instances the change in public relations was a quick and complete reversal of conditions, brought about in a surprisingly short period of time through a change in method and attitude on the part of railway managements themselves.

Furthermore, the speaker pointed out, the change in the condition of franchises was accompanied by a breakdown in the former arbitrary 5-cent fare which had become a political fetish upon which politicans rode into office with a total disregard of the fundamental transportation requirements of their communities. With only a few notable exceptions the 5-cent fare has been definitely eliminated throughout the country and it is of particular significance that a satisfactory solution of local transportation problems seems most remote in those cities that have continued to be misled by fixed 5-cent fare advocates.

Ability to Earn Adequate Return Primary Question

All of this, declared Mr. Gordon, is evidence of the marked improvement in the basic conditions that underlie the local transportation industry. He held that only one great question exists to which the answer appears to be in doubt. That, in brief, is the question of the ability of the industry to earn a satisfactory return at any reasonable level of rates in the face of growing competition from private automobiles. It is to this question that any discussion of the outlook for the industry inevitably leads.

On this point Mr. Gordon maintained that local transportation rates have been largely makeshift expedients, and that there has been no really serious effort to develop the principles upon which an economically sound local transportation rate structure should be built. The speaker explained that the question of proper rates is only one phase of the general problem of meeting automobile competition. He declared that there is a great need for the perfection of more satisfactory vehicles and for higher standards of service. There is likewise great need for the application of merchandising methods in the transportation business; for the rerouting and relocation of lines that no longer serve efficiently—in fact, for the application of those many methods and practices which have produced improvement on individual properties but which are being adopted only very slowly by the industry as a whole. Although there has been much discussion of the need for improved service and methods in meeting the changed condition brought about by the competition of the automobile, the surface has barely been scratched in the application of the many ideas advanced. Until greater progress is made in meeting the requirements of this changed situation there is no substantial reason for questioning the ability of the industry to earn a fair return.

Public Subsidy Expedient Condemned

The speaker condemned the tendency which has been evidenced in recent discussions to grasp at another expedient; namely, some form of public subsidy for transportation properties. If it should ever become apparent that a proper combination of rates and service will not attract sufficient revenue to put the local transportation business on a satisfactory financial basis, he held that any form of general public subsidy would lead to constantly recurring difficulty and would offer little hope of permanent improvement or stabilized finances that would permit the industry to keep pace with a growing community's requirements.

As an alternative for a general public subsidy, the speaker suggested relief from special taxes and imposts as a means of removing from the industry unjustified burdens that directly affect the cost of providing service vital to the community. He held, further, that it would be economically sound, and equitable as well, for a community to consider the track structure and rails as a special form of paving to be assessed, as are other street improvements, against the property directly benefited by the existence of a public transportation facility in a given location. Mr. Gordon explained that the principle involved in relieving the car rider of the fixed charges on the capital invested in street railway track and spreading the cost over the property benefited by the existence of such a transportation facility in a given location is similar to that at present widely advocated for the construction of rapid transit lines, and to the principles at present followed in the operation of buses over pavement in which the capital investment is wiped out through the special assessment method. The rental charge or tax to be imposed upon an operating company for the use of such community-owned facilities, according to the speaker, should be limited to a sum adequate only for the proper maintenance of the facility provided, whether it be a rapid transit line, a street car line or just the surface paving of the street itself.

Results for Fare Changes Discussed

The general subject of fares and fare structure occupied considerable attention during the discussions at the conference. O. A. Smith, passenger traffic manager Pacific Electric Railway, outlined the experience of his property in attempting to establish a rate structure which would bring a satisfactory volume of revenue. The general plan followed is that of zone rates supplemented by various forms of passes. Mr. Smith felt that on the basis of Pacific Electric experience the zone system is both desirable and wise.

Some of the principles involved and the experience to date on the Los Angeles Railway resulting from an increase in fares from 5 to 7 cents was outlined by G. B. Anderson, superintendent of transportation Los Angeles Railway Corporation. When fares were recently increased from 5 to 7 cents cash, or four tokens for 25 cents, there was some decrease in the volume of travel. However, an immediate increase in the amount of service provided, resulted in bringing the travel back nearly to what it had been before the fare increase. On the basis of Los Angeles experience to date, Mr. Anderson expressed the opinion that the combination of an increased fare with a corresponding improvement in service is a step in the right direction in approaching the problem of developing increased revenue.

A brief outline of the conditions existing in San Diego and of the outlook for the transportation property of the San Diego Electric Railway was given by S. E. Mason, general manager. In this southern California city, having a population estimated between 160,000 and 170,000, where wide streets and moderate temperatures offer unusual attractions for the use of automobiles, this company has held its traffic and revenues to a favorable figure through improved service and a combination of zone fares and several forms of passes to attract riders. Mr. Mason pointed out that, although the property has continued to enjoy increasing business, the rate of increase has not corresponded with that of the growth in population.

An unusual example of high-speed interurban operation with one man was described by Julian M. Bamberger, president and general manager Bamberger Electric Railroad, Salt Lake City, Utah. On this property, which is a double-track line approximately 36 miles long, there are ten zones with a fare of 10 cents per zone. All passenger equipment was rebuilt for one-man operation. These cars are run at speeds of 55 to 60 m.p.h. Carload and l.c.l. freight business has been built up by consistent and intensive effort, so that passenger revenue now represents only 55 per cent of the total, whereas it formerly constituted 74 per cent of the entire revenue. Mr. Bamberger expressed the opinion that the industry has in the past feared new ideas and has been more inclined to find reasons why new things could not be done than to meet changed conditions with a serious effort to develop changed methods.

Depreciation Accounting Requires Attention

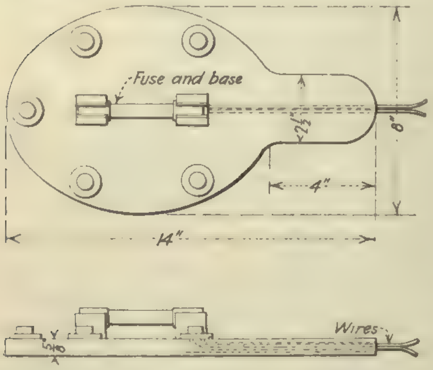
Subsequent discussion covered a wide range of additional operating questions. These included recent developments in trucks and equipment, particularly the new type worm-drive trucks; results of the trackless trolley experiments in Salt Lake City; handling of complaints; possibilities of pick-up and delivery service on interurban roads; experience with amusement parks and special beach traffic, football traffic, etc.; use of de luxe buses for special service, and depreciation accounting by electric railways. The latter subject was brought up by R. O. Crowe, auditor of the Los Angeles Railway, who maintained that the present Interstate Commerce Commission classification of accounts does not give a true record of costs and is misleading and unfair to the investor with respect to depreciation. Although the limited time available did not permit Mr. Crowe to go into this question at length, he called attention to the seriousness of this problem and declared that electric railways need to give very much more serious attention to the establishment of sound principles of depreciation accounting than has been done in the past.

At the close of the meetings a portion of one afternoon was devoted to an inspection of the "comfort cars" developed by the Market Street Railway in San Francisco, and of the sample four-wheel car built by the Twin Coach Corporation and in experimental service on the Key System Transit Company in Oakland.

Better Maintenance Through Improved Methods

Fused Portable Lamp Bank

FREQUENT trouble formerly was experienced in the shop of the New York & Queens County Railway, Woodside, N. Y., because of portable lamp banks becoming short circuited or grounded. The shop fuse was always blown when this occurred, which extinguished any other lights on the same circuit. This condition compelled a number of men to stop work until the fuse was replaced. To prevent this the lamp bank shown in the accompanying sketch was designed and constructed. It consists of a piece of white pine $\frac{5}{8}$ in. thick, 14 in. long and 8 in. wide. It is spoon shaped and provided with a handle 4 in. long x 2½ in. wide. Five lamps and a fuse are installed and connected in series for operation on a 550-volt circuit. The handle is bored for the entrance of the wires. The fuse is of such capacity as will protect the five lights only. In case of a short circuit or a ground occurring, the fuse will blow and the shop fuse will not be affected. It has successfully accomplished the results for which it was designed.



Banjo lamp cluster with fuse used in New York & Queens County Railway shop

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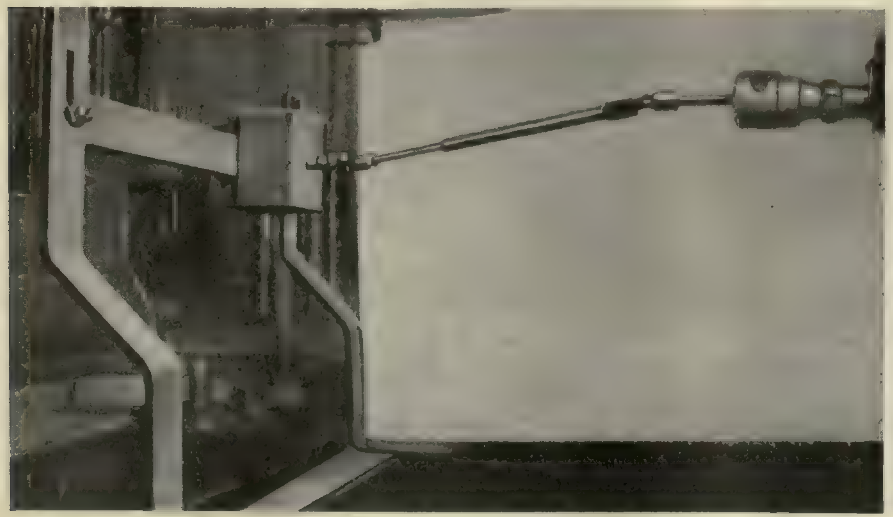
Revolving Oscillating Valve Grinding Device*

By Harvey L. Bullock

Superintendent of Electrical Equipment
Cleveland Union Terminal
Cleveland, Ohio

FOR grinding compressor head valves a power-driven device connected with a small compressed air motor through a telescope shaft and universal joints is in general use in the White Plains shop of the New York Central Railroad. A smaller hand operated model is also used for reseating electro-pneumatic valves which are used with General Electric Company's PC-10 controllers.

This valve-grinding device, which can be found in many automobile repair shops, is composed of two disks mounted on a horizontal shaft on opposite sides of a pinion, the latter being fitted to the end of a vertical shaft and connected to a spring-cushioned sleeve and screw-driver bit. One disk has six teeth and the other nine. This causes the bit to operate and the unequal number of teeth on the disks causes the bit to make one complete revolution to every five oscillations. The arrangement makes a simple, accurate tool.



Valve-grinding device used in the shop of the New York Central Railroad

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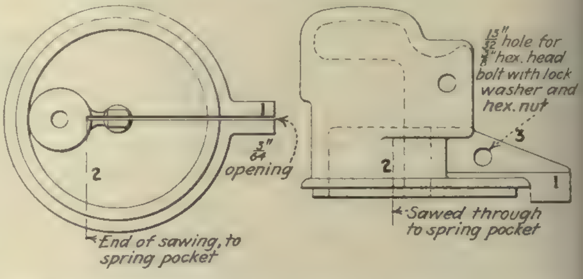
Clamping Arrangement Keeps Controller Handle Bases Tight*

By F. A. Marsh

Superintendent of Equipment Municipal Railways of St. Petersburg, Fla.


1
2
$\frac{3}{64}''$ opening
End of sawing, to spring pocket
$\frac{13}{32}''$ hole for $\frac{3}{8}''$ hex. head bolt with lock washer and hex. nut
3
2
1
Sawed through to spring pocket

Saw-split and clamping bolt method of keeping controller handle bases tight

TROUBLE from looseness due to wear formerly was experienced on the safety car device type of K-10 controller handle base and pilot valve, as used on the cars of the Municipal Railways of St. Petersburg, Fla. Despite the setscrew which is provided with this equipment, the base sometimes gets loose on the controller drum shaft and tips over until the stop lug drags on the controller housing. This condition has been overcome by stripping the base and cutting the $\frac{3}{64}$-in. saw kerf through the lug and base to the spring pocket, as shown in the accompanying sketch. A $\frac{13}{32}$-in. hole is drilled and by installing a $\frac{3}{8}$-in. hexagonal headed bolt with a lock washer and nut the base is ready for use.

As the controller drum shafts have become worn and are out of true, these are built up by brazing and are then milled to the original dimensions. The complete job costs about $1.90 per car, and this small expense has made the device more solid than originally, and has overcome the trouble.

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*Submitted in Electric Railway Journal Prize Contest.

*Submitted in Electric Railway Journal Prize Contest.

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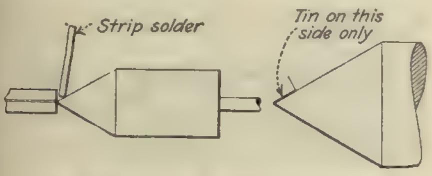
Saving Solder

By Dr. James Silberstein
Chicago, Ill.

To facilitate soldering operations, the solders commonly used for electrical apparatus come in strip or wire form. Many times it is necessary to hold the soldering iron in a horizontal or nearly horizontal position, and then only the upper side at the edge of the soldering iron should be tinned. This results in a considerable saving in solder and also a saving in the time necessary for the soldering operation.

If both sides of the iron are tinned, part of the solder runs through the space between the soldering iron and the metal part against which the iron is held. The part of the solder which runs through and drops on the floor is ordinarily much greater than the part which flows into the joint. The floor spillings are ordinarily not lost, since they can be remelted, but they become dirty and there is danger of getting the contaminated metal mixed with good metal, which of course reduces its value.



Proper method of applying solder with iron in horizontal position

By tinning the upper side of the soldering iron only, the solder flows first into the joint and then any superfluous solder runs out. It is evident that there is a saving not only in solder but in time and labor as well.

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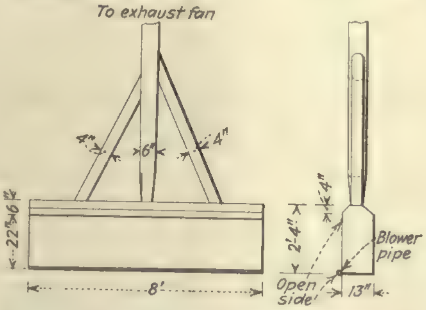
Hood for Sign Painting Used in St. Louis

To remove the paint fumes while lettering destination signs with an air brush using Duco, a convenient ventilating hood has been developed in the shops of the St. Louis Public Service Company. This hood is of sheet metal, 8 ft. long, 28 in. high and 13 in. deep. A half-inch perforated pipe runs along the bottom of the ventilating frame and a stream of air from these openings forces the fumes up the three large vent pipes in the top of the hood. These three vent lines are connected together in a main vent which is equipped with an exhaust fan.

Destination signs are stencilled quickly, easily and safely with an air brush and Duco under this sheet metal ventilating hood



The ventilating hood occupies little floor space, yet is large enough to permit of rapid handling of freshly lettered signs

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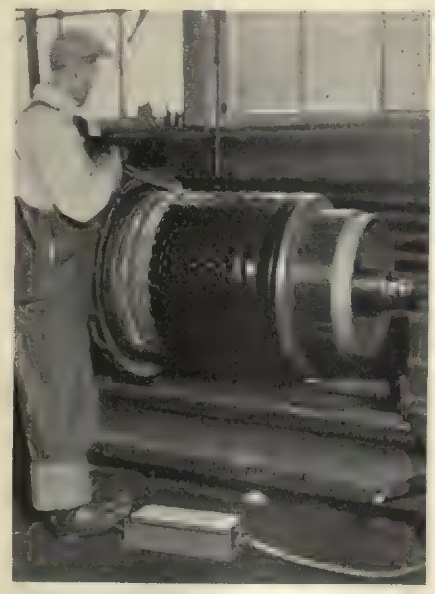
Foot-Operated Belt Shift for Banding Armatures

One man can now wind and solder the banding wires on large railway motor armatures with the foot-operated switch shown in the accompanying illustration and a pneumatic belt shifting device in use in the Deer Lodge shop of the Chicago, Milwaukee, St. Paul & Pacific Railroad. Owing to the size and length of these armatures and the space required to place and remove them from the lathe, it has been found impractical to employ belt-shifting levers on the lathe drive. To obviate the necessity for a man to control the lathe, an electric foot switch connected by flexible armored cable to a solenoid, which in turn actuates the valve on an air-operated belt shifting engine, is used. The engine is mounted on the ceiling near the motor.



Foot-operated belt shift enables one man to band armatures

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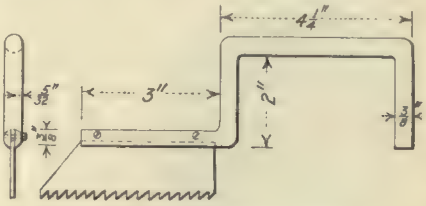
Commutator Slotting Hand Saw

All commutators are slotted by a power-driven circular saw in the shop of the Richmond Railways, Staten Island, N. Y., but it was found in many instances that small particles of copper remained in the slots and a thin film of mica adhered to the commutator bar after the slotting process was completed. This condition caused failures when the armature was under test, and in several instances service failures. It was, therefore, decided to clean out each slot with a hand saw after the circular saw work had been completed. This is accomplished by the tool shown in the accompanying sketch, which was designed and constructed in the company's shop. The frame is made of ⅜-in. round iron and is 7¼ in. long over all. The handle is 4¼ in. long and is provided with a 2-in. offset. A piece of an ordinary hacksaw blade is used for cutting. The end of the frame is split for a distance of 3 in. and the two pieces clamp the saw blade by means of two machine screws. Blowing out the commutator after the circular saw slotting and cleaning the slots with the hand saw have eliminated the previous troubles. It is claimed that even though a slight additional labor expense is required to complete the slotting process a substantial saving has been effected.



Frame for hand hacksaw used for commutator slotting

Improved Equipment Suggestions

Safety Push-Button Control

DESIGNED primarily for use with the Lincoln induction motor, but also adaptable for use with any type of push-button starter, a new type of safety push button is announced by the Lincoln Electric Company, Cleveland, Ohio. In this a ball top start button is surrounded by a large cylindrical stop button which projcets over the former. This protects it from accidental contact since it can be operated only by the tip of a thumb or finger inserted inside the stop button. The latter can be operated by a finger or the palm of the hand.

New type of safety push-button control

The colors of the push button correspond with accepted standards of signal colors for controlling railway, vehicular and pedestrian traffic. The start button is a vivid green moulded Bakelite with the word "start" in white letters across the ball top face of the button. The surrounding stop button is a brilliant red moulded Bakelite.

The inner mechanism of the control switch is enclosed in an arc-welded steel box 2½ in.x3½ in.x2½ in. in size. All insulated parts are of moulded Bakelite. The exterior is jet black with the exception of the push buttons. Four screws hold the moulded black Bakelite face plate to the container. By removing these screws the operating mechanism may be removed from the case for wiring. The binding posts are indicated by white letters on the moulded black Bakelite, thus preventing chance of error in making connections. An opening in the top of the steel case of ⅞ in. diameter permits entrance of conduit enclosed wire to the button. For easy attachment two holes are located in the back of the case for bolts, rivets, or screws.

Fan-Cooled Totally Enclosed Shop Motor

DESIGNED to meet exceptionally severe operating conditions, a new type totally enclosed, fan-cooled electric motor is being placed on the market by the Cleveland Electric Motor Company, Cleveland, Ohio. The output of any motor is limited largely by the temperature rise. For this reason a totally enclosed motor is larger and more expensive for a given rating than is the "open type."

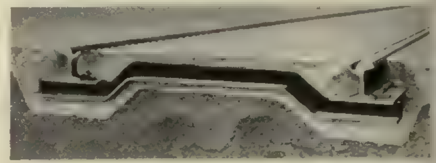
This disadvantage of the totally enclosed motor has already been partly overcome by a recently developed improvement in which the end-covers are open, thus permitting free air-circulation through the motor, the windings being protected by an enclosing jacket of stamped copper having a "running-clearance" hole at either end to permit the shaft to pass through it.

The new Cleveland "Security" ball-bearing type totally enclosed motor, however, goes a step further and eliminates the possibility of even the smallest dust-leakage along the shaft into the windings. The motor is built with a double shell. The inner shell, which contains the entire motor, is enclosed completely and entirely dust-proof. This inner shell is mounted in the outer shell, so as to allow a free air space between them, the shaft passing through both. One end-cover of the outer shell is provided with holes for admitting air.

At the end away from the motor pulley, a fan is mounted in the space between the inner and outer end-covers. This draws in a steady current of air through the holes already mentioned and blows it over the outer surface of the inner shell. Thus, although dust is permanently excluded from the working parts, ample cooling effect is obtained. The makers state that this type of motor permits practically the same rating for a given frame size as an open type motor.

New Shape for Steel Ties Saves Excavation

SAVING 300 cu.yd. of concrete and excavation per mile of single track is the chief feature claimed for the new shape of steel ties just announced by the International Steel Tie Company, Cleveland, Ohio. This tie was developed in conjunction with the engineers of the Capital Traction Company, Washington, D. C. The tie plates are electric-welded to 3 in. x 2 in., 4.1-lb. steel angles. The cross members are bent upward in the form of an elongated arch between the tie plates. This arch strengthens the construction and saves excavation and concrete in a space 7 in. x 3 in. wide, through the entire length.



New steel tie with 7-in. girder rail

High Strength Bronze Welding Rod

AN IMPROVED bronze welding rod, designated as Oxweld No. 21, has been placed on the market by the Oxweld Acetylene Company, New York City. The new rod is recommended for all bronze welding, including the fusion welding of brass and bronze, bronze welding of malleable and gray iron castings, joining of dissimilar metals and building up bearings and other wearing surfaces.

Due to its composition, the new welding rod has a low melting point, and the flow is controlled easily. It produces a weld metal as hard and wear resistant as that formerly made with the manganese-bronze rod. By its use, tough and ductile weld metal having a tensile strength of more than 45,000 lb. per sq.in. can be produced. Properties of this rod eliminate nearly all boiling and fuming of the weld metal. Annoying fumes are reduced.

News *of the* Industry

Higher Fare in Grand Forks

Following the conclusion of franchise negotiations with the city of Grand Forks, N. D., rates of fare on the Grand Forks Street Railway were increased on Feb. 1, 1929, as follows: 8 cents cash; seven tokens for 50 cents; sixteen for $1; and $11 worth for $10 when purchased at the office of the company.

Recently the old franchise was amended and passed by the City Commission, and adopted by the company. The terms of the amendments are: extension of time for ten years, which is in addition to present life of franchise or gives a new franchise for twenty years. Permission was allowed to increase the fare to a rate not to exceed 10 cents and authorization was given to operate buses. There was no relief extended in regard to paving requirements, or repairs to paving. The company still continues to pay in the case of new paving a proportionate strip 8 ft. in width in case of single track and 16 ft. in case of double track.

In accepting the amendments as agreed upon by the City Commission, the company paid old disputed paving claims. This settlement was made for approximately one-third of the original amount. The question of the company's liability for procedure in the case of new paving will be determined when new paving projects come up.

Final Draft of Jacksonville Franchise Presented

The City Council of Jacksonville, Fla., on Feb. 26 stood firmly on its action of two weeks before in requiring the Jacksonville Traction Company, under the direction of Stone & Webster, to double-track its line on Main Street, from Twelfth to 32d by declining to reconsider the ordinance which would have permitted the proposed plan of the company to withdraw its rails on Main Street and supplant railway service with buses to Brentwood, Norwood and Panama Park.

To relieve the transportation situation in the outlying districts on the north side of town, the Council adopted two resolutions, one of which requires the company to extend its tracks to Norwood and Panama Park and the other authorizing the public service committee to negotiate with the company for the rent of buses to serve this territory and to charge a 7-cent fare with full transfer privileges.

The other development of the session was the introduction of the proposed new franchise for the company, the principal features of which are the relieving of the company of original paving charges but requiring it to maintain pavement adjacent to its rails and meet the assessment of the present franchise tax of 3 per cent on gross receipts. Action on the franchise, which must be submitted to the voters of the city within 30 days after passage by the Council, can be had at the city primary election in April if the Council sees fit to pass the ordinance at its meeting on March 12.

At a subsequent meeting between the public service and laws and rules committees of the Council and representatives of the company, it was found that only a few changes to clarify various provisions of the proposed new franchise for the Jacksonville Traction Company will be necessary. The only suggestion for a major change in the proposed franchise was made by Peter O. Knight, general counsel for Stone & Webster interests in Florida, who wanted the 3 per cent franchise tax provision cancelled. This proposal was rejected by the Council committees.

The revised draft of the franchise will be sent to Stone & Webster in Boston for approval. After this is received the Council will act on the measure, which then will be presented to the voters probably at one of the city primary elections on April 16 or April 30.

Co-ordination for Cleveland

Proposal just made would include system of Cleveland Railway in system of Van Sweringen interests which contemplates development of rapid transit facilities

A FINANCIAL proposal under which Van Swerengen interests seek to acquire control of all local transportation services in Greater Cleveland, including the Cleveland Railway, was made public on March 7 by Joseph H. Alexander, president Cleveland Railway. The proposal was approved by the Cleveland Railway directors at a special meeting on March 2.

Through a company known as Metropolitan Utilities, Inc., the Van Sweringens propose to acquire not only immediate control of the Cleveland railway but also actual stock ownership over a period of twenty years. Metropolitan Utilities also is to acquire ownership of four other companies. These are:

The Cleveland Traction Terminals Company, which holds a lease from the Cleveland Union Terminals Company, giving it exclusive rights in the traction terminal zone and also exclusive rights in the concession area in the terminal.

The Traction Stores Company, organized to develop trade possibilities created by rapid transit traffic. It now owns and operates three station buildings on the Shaker and Moreland rapid transit lines and holds other property important for future and similar development.

The Cleveland Interurban Railroad, which owns rights-of-way and facilities used in the Shaker and Moreland rapid transit lines and which leases other rights-of-way from the Cleveland & Youngstown Railroad.

The Cleveland & Youngstown Railroad, which owns a part of the right-of-way used by the Shaker and Moreland rapid transit lines, but leased to the Cleveland Interurban Railroad.

In addition the Metropolitan will own or control rapid transit facilities now in process of construction along the Nickel Plate right-of-way between the Union Terminal and East Cleveland and will own or control such other rapid transit lines as the Van Sweringens may decide to build along the rights-of-way of other railroads entering the terminal.

Stockholders in the Cleveland Railway will be asked to deposit their stock with the Cleveland Trust Company, the Van Sweringen proposal to go into effect when 50 per cent of the stock has been deposited. Acceptance of the proposal is practically assured by reason of the large amounts of railway stock held or controlled by Cleveland banks, officers of which are members of the railway board.

The carrying out of the financial agreement will not require an amendment to the Tayler grant, nor will it be subject to any action on the part of the City Council of Cleveland. The Council will continue to exercise control over service and capital expenditures of the Cleveland Railway, but will have no direct voice in the planning and operation of rapid transit services.

It is known that the rapid transit operating plans contemplate operation of the Shaker and Moreland rapid transit lines and the projected Nickel Plate rapid transit, but it has not yet been announced what other rapid transit lines will be built, how much subway construction will be recommended or what changes will be proposed in street car and motor coach routing to make them conform to a uniform transportation system.

The method by which the Metropolitan proposes to acquire control and eventual ownership of the Cleveland Railway is described as follows:

When 50 per cent of the stock has

been deposited, stockholders will be paid $10 for each share. Interest will be paid by the railway to the depositary and distributed by the depositary to the stockholders at the rate of 6 per cent. Expenses of the depositary will be paid by the Metropolitan.

Stockholders will grant the Metropolitan an irrevocable option to purchase their stock at any time during a twenty-year period at $100 a share plus accrued dividends. The Metropolitan will agree to make an annual payment to the depositary of an amount equal to 5 per cent of the par value of the largest amount of stock at any time on deposit.

This money is to be used to purchase a fixed percentage of stock every year at $100 a share. Thus, if all the stock is deposited, every share will have been purchased by the Metropolitan at the end of the twenty-year period. If there is any failure by the Cleveland Railway to pay a dividend, the Metropolitan may advance to the depositary an amount sufficient to make such payment. If the Metropolitan fails to advance such amount, stockholders may offer their stock to the Metropolitan and the Metropolitan will be obligated to purchase it at $100 a share.

The rapid transit committee of the Cleveland Railway is composed of President Alexander, A. R. Horr and John Sherwin. In a report to the directors they said that their recommendation in favor of the proposal was based chiefly upon the conviction of the members that co-ordinated control and operation of transportation facilities in the metropolitan area will result in decreased cost of furnishing since and will materially increase the factor of safety of the 6 per cent return to which the Cleveland Railway stockholders are entitled under the Tayler grant. The operation of competitive facilities, on the other hand, would inevitably result in waste and excessive costs.

To the committee "it seems clear that if private interests, already embarked in rapid transit enterprises, can see their way clear to bear the burden of the experimental years and undertake the great task of financing rapid transit development as rapidly as the needs of the city justify transit extension and, at the same time, those private interests can be brought into a sympathetic and co-ordinated relationship with the Cleveland Railway without disturbing the relations between that company and the city, on the one hand, and the security of the investment of the stockholders, on the other, the best approach to this new problem of development will have been made."

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Supreme Court Recess Without Passing on New York Case

The United States Supreme Court on March 11 recessed until April 8. Among the cases remaining undecided is that involving the issue of the right of the Interborough Rapid Transit to raise car fares in New York City.

Working Order Awaited in Grand Rapids

The Grand Rapids, Mich., City Commission has instructed City Attorney Ganson Taggart to draft the necessary legal procedure to allow the Grand Rapids Railroad to carry out the suggested consolidation of transportation facilities in Grand Rapids by the augmentation to its system of buses and taxicabs. The report of Gerald J. Wagner, city consulting engineer, is the foundation of the service extension and recently the railway, through L. J. DeLamarter, vice-president and general manager, informed the commission that the company was willing to invest in the added service if the city would promise a broad policy of co-operation. With the proposed arrangement that now seems assured of realization, the railway plans to furnish mass, group and individual transportation services for the convenience of all classes.

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Operation to Be Continued in Colorado Springs

The Colorado Springs & Interurban Railway, Colorado Springs, Col., will continue to operate regardless of the accumulated deficit of $470,696, according to William Lloyd, president of the board of trustees Myron Stratton Home Corporation, owners of the company. With substitution of buses on some lines and readjustment here and there, they business for 1928 showed a loss of only $57,306 compared with $77,808 during 1927, when abandonment was considered.

Colorado Springs is laid out so that most of the people live within walking distance of the office and business district, and most of those who live a little farther out own automobiles. It is a real tourist city, but during the summer months there are numerous sight-seeing bus concerns that garner the visitors. It is generally conceded, withal, that the railway is coming back into favor.

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New Fare Basis Likely in Vancouver

Demands of Vancouver citizens for revision of the agreement with the British Columbia Electric Railway are being presented to the company by a committee of the City Council. In this connection, Mayor Malkin explains that the Council committee will present the city's case for a uniform fare over the whole greater city, for extensions to the transportation services and increased rolling stock. The result of the meeting will be reported to the City Council. If the committee fails to agree with the company, it is possible that discussions will be continued by the full aldermanic board. All hearings must be completed by April 8, 30 days before expiration of the agreement betwen the old city and the railway.

At present the fare in the city limits is 6 cents. The company feels the rate should be increased while the city, which recently amalgamated with Point Grey and South Vancouver, desires a reduction. At present the car fare through the two municipalities which have become part of the city is 12 cents, or 7 cents if strip tickets are used. A compromise believed to be fair would give 6½ cents as a uniform fare for the three areas, if tickets are used, with 7 cents when the fare is paid in cash.

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Fare Question Up Again in Washington

Directors of the Capital Traction Company, Washington, D. C., are expected soon to consider renewing their application to the Public Utilities Commission for an increase in fare.

The company applied for the increase of fare on June 14, 1928, and several public hearings were held. In the course of the hearings the commission ordered the Washington Railway & Electric Company made a party to the case. This action was interpreted as meaning that any increase to the Capital Traction would also apply to the railway.

The case was decided on Oct. 24, 1928, when the petition was dismissed without prejudice to the Capital Traction Company to renew its petition at any time subsequent to March 5, 1929. The reason for the action was that legislation looking to a merger of the railways was at that time pending in Congress, and the commission wished to await the outcome of the merger bill.

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Responsibility in Philadelphia Accepted by Commission

Full responsibility for the drafting and introduction of the enabling legislation to permit the condemnation of the underlying companies of the Philadelphia Rapid Transit Company by the city has been accepted by the Public Service Commission.

Commissioner Benn, who sponsored the measure, acted in the matter for and by direction of the commission as a whole. This step was taken, the commission explains, to carry out the recommendations of its own expert investigator, Judge McChord, that condemnation was the "only permanently satisfactory solution of the Philadelphia transportation problem." Its own activity in the matter the commission defends as logical and in line with precedent, and as one commentator put it "in this it makes out a case that will be proof against reasonable criticism." The Philadelphia *Ledger* says:

> The clearing up of this particular point, however, does not obviate the need for a thorough inquiry into the affairs of the P.R.T. There can be no permanently satisfactory solution of the transit problem here until all these doubtful points are clarified nor until the audit now in progress has restored a confidence that has been greatly shaken by the numerous charges that have been made and by the suspicions that have been raised.

Consolidation Bills in Chicago Ready for Submission

Four of the legislative bills needed to pave the way for a settlement of Chicago's local transit problems have been completed and will be submitted to the City Council for approval on March 18 or at a special meeting to be held soon after that date. The measures now ready provide for consolidation of local transportation facilities, creation of a metropolitan transportation district and a local regulatory commission, an indeterminate permit and construction of subways by the city. The bills were prepared by the city's attorneys in co-operation with Walter L. Fisher, legal advisor of the citizens' traction settlement committee, appointed by Federal Judge James H. Wilkerson to assist the city and companies in coming to an agreement. Favorable action by the Council will allow the bills to be presented in the Assembly before it adjourns.

A proposal that James Simpson, chairman of the citizens' committee, resign from his position was made in an open letter delivered to members of the City Council recently by John M. Harlan, attorney for F. J. Lisman and associates of New York, who are seeking a twenty-year street car franchise in Chicago. Mr. Harlan based his suggestion on the ground that Mr. Simpson was disqualified to serve in this capacity because of a personal interest in the Chicago Rapid Transit Company. Mr. Simpson is a director of the Commonwealth Edison Company, an associated utility company. In a formal reply to this charge, the head of the citizens' committee declared that he told Judge Wilkerson before he was appointed that he was a director of the Edison company. "I told him that my resignation would be in his hands from the time of my appointment until it is accepted or the job is done," said Mr. Simpson, "and that statement still holds good."

Interborough Against Transit Bill

The Interborough Rapid Transit Company, New York, has attacked the transit control bill now pending before the Legislature, designed to aid in the unification of the city's rapid transit facilities by setting up a board of transit control to take over and operate the lines which are to be merged in a new system. In the preparation of the plan representatives of the Brooklyn-Manhattan Transit Corporation have co-operated with the city and the Transit Commission, but the Interborough has held aloof. Under the tentative plan now before the Board of Estimate the rapid transit lines of the B.-M. T. will be linked with the new Eighth Avenue subway being built by the city and intended originally to be run by the municipality. The Interborough is left to be dealt with later. If in the mean time the Interborough should win its suit for an increase in fare, the city in all probability would proceed to exercise its right of recapture and take over the east-side lines of the Interborough. This would leave that company with only its west-side lines and the unprofitable elevated. As one of the commentators sees it, in that event the Interborough's west-side lines would face the competition of the new Eighth Avenue subway, operating at a lower fare. If the Interborough should lose its fare suit, the city might even then persist in taking over the recapturable half of its subways.

Commission Authorizes Operation in Newark Canal Bed

Operation of a rapid transit line by the Public Service Co-ordinated Transport along the bed of the old Morris Canal in Newark, N. J., in accordance with an agreement reached between the company and the city on Jan. 9 last, has been approved by the State Board of Public Utilities Commissioners. According to the commission, the contract provides for the operation of the new rapid transit line as an addition to the existing transportation lines of the Public Service Company in Newark. Since it will avoid the congested area of Newark, the new line will afford a more rapid service to passengers.

Recommendations Made by Rolling Stock Committees

Members of the standing and twelve special committees of the rolling stock division of the American Electric Railway Engineering Association met in Cincinnati, March 11 and 12.

Hugh Savage, chairman of the current collecting devices committee, stated that equipment men on many properties failed to answer the questionnaires which his committee had sent out. Others gave unreliable information to create a good impression. All of this hampers the committees that are really working for the interest of the industry. The committee recommended three standard sizes of trolley wheels, three standard sized trolley poles, and a standard hardness for manufactured wheels.

In a paper entitled "Proposed Standard Car Change Record," E. J. Jonas, superintendent of equipment of the Cincinnati Street Railway, suggested that the term "car change" be substituted for "pull-in" because it is a more concise and clear description of what takes place when a car fails in service. He also suggested a schedule of classification of pull-ins arranged under a few general groups that give opportunity for thorough analysis of conditions as well as a basis for comparison.

A. T. Clark told of favorable experiences in Baltimore with low viscosity oil in journal bearings. Other chairmen reported on various maintenance problems.

The members were entertained by the Cincinnati committee including several local manufacturers and manufacturers' representatives. They also inspected the Cincinnati Car Company shops and the Winton shop of the Cincinnati Street Railway.

Severe Snows in South

Nashville, the capital city of Tennessee and the middle division, suffered more from snow that has blanketed parts of the South than did west Tennessee. The snow fall at Nashville was about 15 in.; at Gallatin in Sumber County, a city served by interurban lines, the snow fall was 14 in. There were few autos on the streets on Feb. 20 and 21, only the buses and cars operated by the Nashville Railway & Light Company and the milk wagons being very active. Many moved on foot to their work, but the railway was able to maintain its schedules with only little interruption. The snow fall at Memphis and in west Tennessee, approximately 8 in., was the most severe since 1917, but the record at Nashville in 1892 was 17.1 inches in 24 hours. There have been colder weeks than the one recently ended, but very few in which there has been so much sleet, snow and ice. Few of the recent winters in middle and west Tennessee have been severe and in most of them in recent years there has been no snow. The mountainous sections of east Tennessee, of course, have winter snows.

Lexington, Ky., and central Kentucky experienced the heaviest blanket of snow in twelve years. With recurrent falls within 24 hours, the snow fall amounted to 10.3 in. As a precaution against suspension of service the Kentucky Traction & Terminal Company kept the city cars running all night. The interurban system did the same.

Arkansas experienced the heaviest general snow since 1921. The storm prevailed from the Ozarks on the northwest to the Mississippi on the east. The snowfall ranged in depth from 2 in. to almost 12 in., in some parts of the state. Texarkana, on the southwest border, had snow. Little Rock had quite a heavy snowfall, 6½ in. in one night, the heaviest storm of its kind in several years. The Arkansas Power & Light Company kept its snow fighting equipment in continuous operation day and night during the progress of the storm. So seldom are snow sweepers seen in Little Rock that their use by the Arkansas Power & Light Company on the night of Feb. 20 and the day following was of sufficient news value to lead the *Arkansas Democrat*, the afternoon newspaper, to print a picture of the snow sweeper in operation.

The fall of sleet and snow in Little Rock totalled 6½ in., the heaviest in several years.

A. R. Koonce, general superintendent of the railway department, put the snow sweepers in operation shortly after the snow began to fall on the afternoon of Feb. 20 and kept them going throughout the night with the result that railway schedules were maintained as usual.

With the streets covered with sleet and snow, many who usually go to and from work in automobiles were unable to start their cars and others were afraid to tackle the slippery thoroughfares. Thousands were surprised and gratified to discover that railway service was being maintained as usual.

Carries Entire Worcester Population Every Other Day

The Worcester Consolidated Street Railway, Worcester, Mass., is carrying a series of constructive newspaper advertisements to show the value of railway service to the community. In the latest advertisement the company relates that it carried in its cars and motor coaches last year 37,396,261 passengers. The advertisement says the Chamber of Commerce estimates the population of the city of Worcester at 206,000. Therefore, the company says that on its cars and coaches last year it carried the equivalent of each person in Worcester 183 times or the whole population of Worcester every other day.

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Four New Bulletins by Bureau of Information and Service

Special reports are being prepared by the American Electric Railway Association to be available to member companies, as follows:

BULLETIN NO. 244—*Wages of Trainmen*—An entirely new edition of the association's regular wage bulletin based on replies of approximately 500 companies to a questionnaire sent out in February, 1929. It shows the present wage scale, the effective date and date of expiration, previous scale, union affiliations of trainmen, number of men employed, contract provisions governing the wage scale, and the average weekly wages earned by regular and extra men under the scale.

BULLETIN NO. 245—*Wages of Bus Men*—Gives for bus operators substantially the same information as is contained in Bulletin No. 244 for trainmen, namely: the present scale of wages, the effective date and date of expiration, union affiliation of bus men, if any, number of bus men employed, average weekly wages earned under the scale, etc. Information furnished by about 250 companies is included.

BULLETIN NO. 246—*The Regulation of Parking*—A summary of the parking regulations in effect in about 50 American cities showing the extent to which parking is restricted or otherwise controlled. It also indicates the extent to which these regulations are enforced, the attitude of the public toward them, the degree of success attained in expediting the movement of traffic through streets, and whether or not further regulation is contemplated.

BULLETIN NO. 247—*Index to Street Railway Valuation Cases* 1915 *to* 1928—A classified list of references to rulings of courts and public utility commissions in electric railway valuation cases. A total of 107 decisions of public utility commissions and federal and state courts, handed down during the period 1915 to 1928, have been collected and analyzed with a view to showing the trend of decisions on the more important questions comprised in the subject of street railway valuation. Decisions in 26 cities, the District of Columbia and Canada are included.

COMING MEETINGS OF *Electric Railway and Allied Associations*

***March 20*—Central Electric Traffic Association, Keenan Hotel, Fort Wayne, Ind.**

***March 21*—New England Street Railway Club, Annual Meeting, Boston, Mass.**

***April 5*—Metropolitan Section, American Electric Railway Association, 33 W. 39th Street, New York, N. Y.**

***April 12*—Maryland Utilities Association, Annual Meeting, Hotel Emerson, Baltimore, Md.**

***May 1-3*—Indiana Public Utilities Association, Indiana Gas Association and Indiana Electric Light Association, annual joint convention, Hotel Gary, Gary, Ind.**

***May 13-15*—National Highway Traffic Association, annual meeting, Stevens Hotel, Chicago, Ill.**

***May 15*—Association of Electric Railway Equipment Men, Middle Atlantic States, semi-annual meeting, Wilmington, Del.**

***June 3-6*—National Association of Purchasing Agents, Annual Convention, Hotel Statler, Buffalo, N. Y.**

***June 5-7*—Canadian Electric Railway Association, annual convention, Montreal, Quebec.**

***June 21-22*—New York Electric Railway Association, Bluff Point, N. Y.**

***June 27-28*—Central Electric Railway Association, Michigan City, Ind.**

***July 24-26*—Electric Railway Association of Equipment Men, Southern Properties, Lexington, Ky.**

***Aug. 15-16*—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.**

Sept. 28-Oct. 4—**American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium, Atlantic City, N. J.**

One-Man Operation Desired in Shreveport

All street cars of Shrevesport, La., will be placed under one-man operation provided a petition filed with the City Council by the Shreveport Railway is granted. A few of the cars now are one-man but most of them are required by city ordinance to have a conductor as well as a motorman. The company wants to go to one-man operation as a matter of economy. It sees a further increase in fares or ultimate collapse unless the request is granted. Repeal of a city ordinance adopted in 1907, requiring two men on cars in the city, is needed.

Information Committee in Pennsylvania Discontinued

Announcement was made on March 13 by Philip H. Gadsden, chairman, that "the work of the Pennsylvania public service information committee had been discontinued." Mr. Gadsden is vice-president of the United Gas Improvement Company of Philadelphia. He praised the work of the committee and said its services were now being handled by the individual companies.

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Special Luncheons and Dinners on South Shore Line Diners

Introduction of a new special luncheon and special dinner on the menus of the Chicago, South Shore & South Bend Railroad diners is announced by the management. Suggestions from patrons that special one-price meals be introduced made the change desirable. Sample menus, furnished by the dining car department for the sake of illustration, carry four entrées on the luncheon, and five courses on the dinner.

◆

Three Chicago Employees on Safety Scroll

Three employees of electric interurban railroads serving the Chicago metropolitan area were awarded the Britton I. Budd Medal for the Saving of Human Life on the evening of Jan. 22, when more than 600 employees of the Chicago Rapid Transit Company, Chicago, North Shore & Milwaukee Railroad (North Shore Line), Chicago, South Shore & South Bend Railroad (South Shore Line), Chicago, Aurora & Elgin Railroad ("Sunset Lines") and the Marigold Motor Coach Lines of the Metropolitan System gathered in the grand ballroom of the Palmer House, Chicago, for their seventh annual first aid and safety banquet. The men honored were John B. Andrews of the North Shore; John E. Haney of the South Shore, and Henry W. Matthews of the Elgin line.

This makes a total of seventeen employees of the various transportation companies who have saved human lives as a result of training in first aid principles. Of the three men saved by those to be honored on Jan. 22, two are in no way connected with the utility companies, while the life of one was saved at a place entirely removed from company property.

The medals were presented to the three life savers on behalf of Mr. Budd, president of the companies, by George R. Jones, vice-president of the Public Service Company of Northern Illinois and chairman of the committee of awards. The banquet also celebrated the establishment of a new record in first aid training among public utility employees of the Chicago metropolitan area. A total of 558 employees of the five companies completed the training course during the past year. The Rapid Transit Lines lead with a record total of 317 graduates. All these completing the course received company certificates and American Red Cross diplomas in recognition of their contribution to the safety and welfare of the public.

◆

Higher Fares Sought in Augusta

The Georgia Power Company, which recently purchased the Augusta-Aiken Railway & Electric Company, Augusta, Ga., has petitioned the City Council for an increase in fares to provide for an extensive rehabilitation program. Under the proposed schedule the present 10-cent cash fare would remain, while the token fare of 7 cents now charged would be increased to 8⅓ cents, sales being in quantities of three for 25 cents. The 5-cent ticket for school children would be continued, but the present 5-cent ticket for school teachers would be discontinued, along with the regular 5-cent children's tickets good at other than school hours.

If the fares sought are allowed, the Georgia Power Company is prepared to expend approximately $310,000 in improving the present facilities in Augusta.

◆

Bill Creating Seattle Commission Progresses

With the passage in the Senate of Senate Bill 296, first steps were taken toward creation in Seattle, Wash., of a street railway commission of seven members to take over and operate the Seattle Municipal Railway system. Under the bill, the commission would have complete power in all matters pertaining to the railway system and refunding of bond issues. It is prohibited from incurring general obligation indebtedness against the city.

Senator E. B. Palmer, who introduced the bill, declared that sooner or later Seattle would be forced to go into the general fund to make good a deficit of $1,500,000 incurred when the system was operated on a fare which brought in revenue below the demands, and that, before such a levy would be made, the system would have to be reorganized and placed upon a business rather than a political basis. Senator Heifner took issue with him, declaring that the bill would permit a refinancing and reorganization of the system on business lines and this would place the system upon a self-supporting basis without any need for general fund aid.

The Seattle City Council, meeting in committee of the whole, registered unanimous disapproval of the commission measure, and set on foot an effort to stop the bill's progress. Councilman E. L. Blaine fears that loans made to the street railway by the city light and city water departments might not be repaid should a group of citizens be given charge of the railway system. Even the political wiseacres appear to be unwilling to hazard a guess about the final disposition of the municipal railway matter.

Recent Bus Developments

Commission Sees Need for Bus Regulation in New York

The annual report of the Public Service Commission of New York, transmitted recently to Governor Roosevelt and the Legislature, said that transportation by bus continued to expand at a fairly rapid rate. Besides the many rural and intercity lines operating within the state, a large amount of city service also is being provided. Bus service in addition to railway service is being operated in the following cities: Albany, Binghamton, Buffalo, Cortland, Jamestown, Kingston, Mount Vernon, New Rochelle, Poughkeepsie, Rochester, Rome, Schenectady, Syracuse, Troy, Utica and Watertown.

In the following cities, all of the city transportation service is rendered by buses excepting the local service given in a few cities on interurban electric railroads.

Auburn, Geneva, Glen Cove, Glens Falls, Hornell, Hudson, Middletown, Newburgh, Olean, Oneonta, Oswego, Port Jervis, Rensselaer, Salamanca and White Plains.

The importance of regulation by the commission is found, among other things, in the matter of safety requirements. It is not possible for the commission properly to supervise bus operation with the present available force of two inspectors who are taken from their usual duties of railroad inspection, but it considers inspection of bus operation equally as important as that of steam or electric railroads.

On several occasions the commission has recommended the enactment of more complete legislation dealing with the regulation of bus operation. It regards the existing legislation as fragmentary and unsatisfactory. According to the commission, a new article should be added to the Public Service Commission law, setting forth a comprehensive statement on the subject of bus regulation in similar manner as other utility corporations are now covered by law.

◆

Chicago Ruling Appealed

Petition for a rehearing of the case involving the right of the city of Chicago to compel the Chicago Motor Coach Company to obtain a local franchise for the use of its streets has been filed with the Supreme Court of Illinois by attorneys for the company.

Simultaneously with the filing of the petition with the Supreme Court, hearings were resumed before the Illinois Commerce Commission on the original petition of the motor coach company for permission to operate a total of 34 miles of new bus routes on the west and northwest sides of Chicago. This authority was granted by the commission last October but the Chicago Surface Lines, which had petitioned at the same time for the right to run feeder buses in the same area, appealed to the Circuit Court, which subsequently set aside the commission's order.

The Circuit Court held the commission order to be invalid on the grounds that the Chicago Surface Lines had not been given due notice of the hearings on the bus line's application.

Buses are operated over the new streets pending the outcome of the present hearing.

◆

Sale of Evanston Project Asked

Approval of the sale of the Evanston Bus Company, Evanston, Ill., and the Niles Center Bus Company, Niles Center, Ill., to the Evanston & Niles Center Bus Company, a newly chartered corporation, was asked in a joint petition recently filed with the Illinois Commerce Commission. The Evanston Bus Company, formerly owned by the Evanston Railway, is a subsidiary of the Chicago Rapid Transit Company and the Niles Center Company is controlled jointly by the Rapid Transit and Chicago, North Shore & Milwaukee Railroad. The new company also asked for a permit to operate the respective properties and for authority to issue $350,000 of capital stock.

◆

Expansion of Facilities in Hamilton

By a deal said to have been closed on March 5 and involving a total expenditure of $100,000, the Dominion Power & Transmission Company has acquired several additional bus lines, which will give it control of all bus services entering Hamilton, Ont., except the Gray Coach Lines of Toronto. Lines included in the latest absorption are: United Lines, operating between Hamilton, Caledonia and Simcoe; the Comet Line, operating to Galt; the Pathfinder service to Guelph; and two smaller lines, one operating to Milton, and the other to Binbrook. Acquisition of the Milton Line, however, is deemed important, as this, it is said, will facilitate the round-the-bay service the Dominion Power Company has been endeavoring to provide.

Several months ago the Dominion Power acquired the bus line operating between Hamilton and St. Catharines. Later it took over the Mountain Line, then the Hamilton and Dundas bus services, and also a line operating between Hamilton and Waterdown.

Toronto bus lines strongly opposed the application of the Dominion Company to operate buses over the North Shore route of the bay, but the latest deal will overcome that opposition, it is said.

The local company thus has a fleet

of 80 buses, including those which supplement the service of the Hamilton Street Railway. It is said the deal was consummated by Denman & Company, bankers of Hamilton.

◆

Experiment in Newport News

Service over the East Hampton railway line at Newport News, Va., will be abandoned for a week by the Virginia Public Service Company as an experiment to determine which is more satisfactory for the section, bus or car service. Under order of the State Corporation Commission, the utility may advertise its intention and for one week substitute buses for cars at the same fare now charged.

◆

More Testimony on Amsterdam Operation

No decision was made by the New York Public Service Commission following an oral argument on March 7 on a rehearing granted the Fonda, Johnstown & Gloversville Railroad over the certificate granted to Charles Vollmer for the operation of a bus line in Amsterdam. Wesley Maider, attorney for the railway, asked the commission to reconsider its order granting the certificate and to amend the certificate, alleging a daily loss of revenue to the railway of $32.16 because of bus operation. Mr. Maider said if this loss continued it would mean abandonment of service by the company, which had invested approximately $4,000,000, covering about 80 miles of tracks in Amsterdam, Gloversville and other territory served.

Arthur Kline, attorney for Mr. Vollmer, disputed the loss of revenue claimed by Mr. Maider. He said residents had petitioned the Common Council to grant the certificates to Mr. Vollmer.

◆

New Service in St. Louis

New competition for the People's Motorbus Company and the St. Louis Public Service Company began on March 6 with the opening of a 15-cent de luxe service to operate between Manion's Park, 8600 South Broadway, and Union Market, Broadway and Morgan Street, St. Louis. A schedule has been arranged under which buses are to leave the terminus at three-minute intervals during the rush hours and five-minute intervals at other times. The line will operate between 6:30 a.m. and 7 p.m. The automobiles are to be manned by members of the International Brotherhood of Teamsters, Chaffeurs, Stablemen and Helpers, Local No. 408.

The People's Motorbus Company Broadway line charges 10 cents while the railway fare is 8 cents. The bid for business being made by the new line depends almost entirely on the promise of the promoters to reduce the running time for the round trip over that of the present service.

Provisions of New York Highway Law Combined

Governor Roosevelt, of New York, has signed the Westall bill, combining into one law all provisions of the highway law relating to motor vehicles. This new law is a product of the committee on reorganization of the state government. It was vetoed last year by Governor Smith, but since then certain controversial points have been eliminated.

The new law places under one cover all of the provisions of state law relating to motor vehicles and traffic and sets up standard state-wide provisions for regulating highway traffic outside of the city of New York. These latter provisions are contained in article 6 of the new law and relate to operation of vehicles, right-of-way, signals, meaning of colors, pedestrians' rights and duties at controlled intersections, turning at intersections, parking, safety zones, cab stands, other vehicles, street surface cars, duties of police authorities, powers of local authorities, penalties.

Under the section "Right-of-Way" it is provided that "when in the performance of duty the following vehicles shall have the right-of-way: United States mail, police, fire, fire patrol, bureau of buildings, repair of public service corporations, ambulances and the military, but this shall not relieve the driver or owner of any such vehicle from liability for injuries inflicted in consequence of the arbitrary or careless exercise of this right."

Under the new law colors are restricted in traffic regulation. Section 84 of the new law reads:

> §84. MEANING OF COLORS. Whenever traffic at any intersection is regulated by a traffic control signal, the following colors may be used and none other, and those colors herein authorized shall, when lighted, indicate as follows, except as provided in sections 85 and 86.
>
> Red requires that traffic shall stop and remain standing.
>
> Green requires that traffic shall move.
>
> Amber, when used, shall only warn traffic that the colors in the signal are about to change. No traffic shall enter an intersection controlled by a traffic control signal while the amber is lighted. Amber when used in precautionary signals without other colors, either fixed or flashing, shall mean proceed with caution.

In section 85 it is provided that at intersections whose traffic is controlled by traffic control signals, pedestrians shall cross the street only in the direction of moving traffic and operators of vehicles, when turning, shall yield the right-of-way to pedestrians when so crossing.

A new insertion in the law, under that part where indemnity bonds or insurance policies are required from persons carrying passengers for hire, provides that every person operating a motor vehicle as to which a bond or policy of insurance is required, which in any manner is involved in an accident, shall within five days give written notice of the time and place of the accident to the surety or insurer. Failure to give such notice shall constitute a misdeameanor, but shall not affect the liability of the surety or insurer.

◆

Substitution on Quincy Lines Sought

Authority has been asked by the Illinois Power & Light Corporation of the Illinois Commerce Commission to discontinue railway service on its Maine and Twelfth Streets lines, Quincy, Ill., and to substitute motor coach service. The corporation will pay the city a $50 annual bus license fee and repave all streets where track is removed.

◆

Buses Succeed Cars on Ohio Line

The last car on the Southern Ohio Public Service Company passed over the rails between Newark and Zanesville on Feb. 15. The Columbus and Buckeye Lake end of the line ceased to operate on Jan. 15. This electric interurban road operated between Columbus and Zanesville via Buckeye Lake and Newark for the past 26 years. The Ohio Power Company, which purchased the equipment recently, will continue the operation of buses over substantially the same route.

◆

Temporary Service on Spring Street, Albany

The United Traction Company, Albany, N. Y., will operate buses in Spring Avenue and Hill Street, Troy, under an arrangement to be effected between officials of the company and representatives of the Troy corporation counsel's office. The arrangement will enable a month's trial. If the patronage justifies the service it will be continued.

◆

Permission Sought for Rome Bus Line

The Utica Railway Co-ordinated Bus Line, Inc., filed a petition on March 13 with the Public Service Commission for a certificate for the operation of a bus line in Rome, N. Y., running to the New York Central station. The petition is accompanied by the consent of the Rome Council approved by the Mayor.

◆

Controversy at Menasha Settled

Peace has been declared in the bus license controversy between the city of Menasha, Wis., and the Wisconsin-Michigan Power Company and through operation of buses was renewed on Feb. 23. When the City Council raised the fee from $50 to $300 for each bus and required licenses, the company announced that unless a settlement could be reached all buses would be removed from the Appleton to Neenah and Menasha runs. The license matter was settled by agreement upon a fee based on a charge of a mill per ton-mile. This is the fee charged by the state to public carriers operating on state highways.

Financial *and* Corporate

Louisville Appraisal Presented

Most liberal of five sets of figures by Public Utilities Bureau $2,000,000 under company's claim

AFTER months of work, the Public Utilities Bureau's report on the appraisal of the Louisville Railway, Louisville, Ky., has been handed to the Board of Public Works and Mayor William B. Harrison.

Based on the report covering its investigation of the valuation of property of the railway to establish a rate base to determine a fair and reasonable rate of return, the board submits the following findings:

1. That the rate base on the capitalization of net income for the year ended Dec. 31, 1928, was $12,713,943.

2. That the rate base on original cost of ledger value (book value) for the year ended Dec. 31, 1928, was $21,934,317.

3. That the rate base on the historical cost for the year ended Dec. 31, 1928, was $26,188,718.

4. That the rate base on the outstanding capitalization for the year ended Dec. 31, 1928, was $22,533,210.

5. That the rate base on the reproduction cost new less depreciation for the year ended Dec. 31, 1928, was $26,061,707.

6. That the trend of costs for material used for electric railways increased 103 per cent—1928 over 1913, and the construction costs for electric railways increased 42 per cent—1928 over 1913.

7. That statistical data covering period from 1921 to 1928, inclusive, as shown under exhibit No. 7, indicates the following trend of demand for service of the Louisville Railway.

(a) All passengers carried by street cars showed only 5 per cent increase.

(b) Total passengers carried by street cars and buses showed an increase of only per cent.

(c) Total street car and bus-miles operated were increased 21 per cent.

(d) Total street car-hours operated showed 17 per cent increase.

(e) Passengers carried per car-mile decreased 12 per cent.

(f) Passengers carried per car-mile for combined service of street cars and buses showed a decrease of 14 per cent.

(g) Riding habit per population for street cars showed a decrease of 25 per cent.

(h) Riding habit for combined services of street cars and buses showed decrease of 24 per cent.

In discussion the valuations of property, the bureau said, "unfortunately, no precise definition of fair value has ever been laid down, either by the various statutes providing for rate regulations or by any court in the United States, in passing on the constitutionality of rates from the time of the celebrated case of Munn vs. Illinois State, decided by the Supreme Court in 1876, up to the O'Fallon case now before the United States Supreme Court for a decision." It said further:

> The Magna Charta of "fair value" in the opinion of the Supreme Court in the famous case of Smyth vs. Ames, decided in 1898, was that, as a general principle, a company is entitled to earn a fair return on the "fair value of its property used in public service."
>
> It announced that reasonable rates from the standpoint of investors must allow a fair return upon the fair value of the property.

The bureau found that the price index of 1928 over the average from 1913 to 1922 is equal to 28 per cent; this was arrived at by taking the average price indexes of the electric railway construction costs of the American Electric Railway Association for 1913—equal to 100 per cent—down to 1922. This average was 159.2 per cent and the average price index for 1928 was 203.1 per cent. By applying the 28 per cent, the increase in prices, times $20,677,712 produced the total value of the property Dec. 31, 1922, at $26,467,470. Then additions and betterments were added to Dec. 31 last with additions and deductions for price changes and this produced $28,217,700.

CONFERENCES AHEAD

From this, the bureau said, it deducted $1,138,714 for property not used and useful and $1,540,047 for the depreciation and reserve account carried, making a figure of $25,538,939.

No allowance was made in this, the bureau said, for intangible values such as going concern value, but the inclusion of cash totaling $329,482 was made as were materials and supplies totaling $320,297, making the total rate base on the factors of the particular study of $26,188,718.

The bureau found five values for the company's property on assumptions which must be weighed in arriving at a value, according to the accepted rulings of the Supreme Court.

Conferences are planned between the board and the bureau over some of the figures, conferences between the Mayor and the board with the railway officials, and then after the various phases have been threshed over, a stand by the city for a certain agreed value of the company's property. The highest value found by the bureau is still nearly $2,000,000 under that claimed by the railway in its recent letter to the Mayor.

◆

$11,281 Deficit for Colorado Municipal Line

Fort Collins' municipally-owned railway showed a deficit for 1928 of $11,281 plus the interest on $75,000 outstanding street railway bonds, and $2,709 for street paving improvement district assessments. The total receipts of the system in the Colorado city for the year were $19,106. The expenditures totaled $30,388. Of the total receipts, $17,539 was received for fares. The expenditure made for labor was $17,384.

Change of Trustee Sought for Massachusetts Road

The petition of the American Trust Company, Boston, to resign as trustee under a mortgage made June 19, 1906, by the Lowell & Fitchburg Street Railway, Lowell, Mass., to secure an issue not exceeding $100,000 face value 20-year gold bonds of the railway was heard by Judge Sanderson, of the Supreme Court, on March 5.

The principal of the bonds was payable in 1926, but a bondholders' committee requested that no foreclosure proceedings be instigated at that time. In the petition just filed a new trustee is sought since all members of the bondholders' committee are residents of Gloversville, N. Y., from which a trustee is desired to avoid expense in case a foreclosure sale is necessary.

The railway is operated by the Eastern Massachusetts Street Railway at a small profit. Representatives of the bondholders' committee said that it would be to the best interest of the bondholders to have an individual trustee appointed. Judge Sanderson said he had never known of a nonresident trustee being appointed for a Massachusetts company. Subsequently, the court dismissed the action by consent of counsel.

◆

Ogden Receiver Dismissed

The receivership of the Utah-Idaho Central Railroad, Ogden, Utah, has been lifted by the federal court. Recently the road was refinanced, and the dismissal of the receiver followed the presentation of evidence to show that the outstanding debts of the road had been liquidated. P. H. Mulcahey was receiver for the road.

◆

Patronage Increases in Milwaukee in 1928

During 1928 the transportation system of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., carried 215,823,326 passengers, an increase of 5,036,753 over 1927. This fact was disclosed in the annual report which showed gross earnings for the entire company of $29,510,946 against $27,507,550 for 1927 and a net income of $4,833,750 against a net income in 1927 of $3,966,905. No separate earnings statement for the railway is included.

Ten new street cars and five street car type buses were purchased for the Milwaukee city system, and ten modern cars formerly in interurban service were reconstructed for use on the South Milwaukee suburban line. Eleven cars of a larger and more modern type were placed on the Racine city system. Improved service with electrically-heated one-man safety cars was provided on several Milwaukee lines, and service extensions were made to a number of outlying districts, principally by means of auxiliary bus operation. The company began work Dec. 3 on a rapid transit project that will, by means of a contemplated subway terminal and 2.8 miles of new line on private right-of-way, provide high-speed local service between the heart of the city and the rapidly growing urban district to the west.

The Milwaukee Northern Railway, a subsidiary, was merged with the Milwaukee Electric on April 30, 1928. The former Northern company operated a city street car line in Milwaukee and interurban service to Sheboygan.

One of the outstanding railway projects of 1928 was the relocation and grade separation of about a mile of track in the western section of the city of Milwaukee. This project gives Milwaukee its first four-track electric railway line. Two tracks are used exclusively by the Wells-West Allis suburban cars, and the other two by local and interurban rapid transit lines.

The company's Milwaukee-Racine-Kenosha interurban railway line became a rapid transit route on July 15 when this service was routed over 9½ miles of new private right-of-way immediately south of Milwaukee. Arrangements were made in 1928 for freight car interchange between the company's East Troy-Burlington rapid transit line and three transcontinental steam railroads.

Beginning July 4 and continuing to the end of the tourist season the company operated two daily motor coach trips covering many points of interest about the metropolis. These tours were conducted as part of an international system of co-ordinated local sight seeing trips known, from the color of the coaches employed, as Gray Line Tours. International publicity was given the Milwaukee trips in circulars distributed throughout the territories served by the Gray Line system. The company also took over operation of the popular sight seeing trips, conducted daily throughout the summer in connection with excursions by steamer from Chcago.

35,775,749 More Passengers

Another record year scored by Chicago Surface Lines. Total rides 1,621,215,876, including transfers. Gross earnings more than $62,000,000

STREET car riding in Chicago increased to the extent of 35,774,749 rides last year, according to the report of the Chicago Surface Lines for the twelve months ending Jan. 31. Substantial gains also were made in earnings and in service.

Total rides, including transfers, were 1,621,215,876 and revenue rides, not including transfers, 892,814,620—the latter an increase of 10,355,973 more than the previous fiscal year. Each month of the year, with the exception of April, June and December, showed a gain over the corresponding month of the preceding year. Service was increased 728,354 passenger car-miles.

Life, health and disability insurance was established for all employees and an increase in trainmen's wages amounting to 1 cent an hour was effective after June 1, but residue receipts were $13,430,555, an increase of $37,299 over the previous year.

Gross earnings were the highest in the history of the company, amounting to $62,391,622, an increase of $766,870 as compared with the previous year.

These increases by Chicago street cars, it is pointed out, were made in spite of the fact that the electric railway industry of the country showed a decrease for the year of 1.10 per cent and that steam railroads reported the smallest number of passengers since 1905. In summing up the report, Henry A. Blair, president, said:

Although for two years the Chicago Surface Lines has been operating under temporary franchise extensions without ability to provide adequately for present needs or to plan for the future, it still holds first place among the electric railways of the country as an outstanding example of efficient operation, increasing business and maintenance of the property.

As pointed out in the accompanying report, service was improved and new records were established in the operation of equipment, in car-miles and in accident prevention. Due to economy and efficiency in operation, residue receipts show an increase over the previous year in spite of the added burden of more than $600,000 in increased

CHICAGO SURFACE LINES STATISTICAL DATA FOR THE FISCAL YEARS ENDED JAN. 31

	1925	1926	1927	1928	1929
Rate of fare, cents	7c-6⅔	7c-6⅔	7c-6⅔	7c-6⅔	7c-6⅔
Revenue passenger	830,151,540	842,201,453	876,249,663	882,458,647	892,814,620
Passenger receipts	$57,284,602	$58,076,487	$60,436,705	$60,892,995	$61,597,374
Total earnings	58,081,678	58,785,880	61,173,601	61,624,752	62,391,622
Operating wages	29,246,390	29,012,641	29,812,518	30,280,959	30,348,351
Other operating expenses and taxes	17,328,569	17,615,564	18,058,971	17,950,536	18,612,715
Residue receipts	11,506,717	12,157,674	13,302,111	13,393,256	13,430,555
Less: Joint account expenses	450,000	130,297	363,934	657,038	554,449
	$11,056,717	$12,027,376	$12,938,176	$12,736,217	$12,876,105
5 per cent on purchase price	8,127,158	8,169,099	8,173,948	8,190,354	8,210,205
55 per cent to city	1,611,257	2,122,052	2,620,325	2,500,224	2,566,245
45 per cent to companies	1,318,301	1,736,224	2,143,902	2,045,638	2,099,655

FINANCIAL STATEMENT OF CHICAGO SURFACE LINES FOR YEAR ENDED JAN. 31, 1929

	1929	1928
Earnings:		
Passenger cars	$61,597,374	$60,892,995
Chartered cars	4,447	4,837
Newspaper cars	9,606	16,608
Freight earnings	....	888
Hospital car service	1,590	2,088
Advertising	300,961	290,263
Rents of buildings, etc	173,018	174,741
Sale of power	99,552	98,056
Interest on deposits	192,124	134,438
Miscellaneous	12,950	9,838
Gross earnings	$62,391,622	$61,624,752
Expenses:		
Way and structures	$2,899,168	$3,006,276
Equipment	4,070,336	4,247,925
Renewals	4,991,329	4,929,980
Power—maintenance	394,378	387,445
Power—operation	3,755,123	3,683,540
Conducting transportation—trainmen	21,938,572	21,789,269
Conducting transportation—other	3,273,154	3,246,443
Traffic	98,495	120,177
General and miscellaneous—damages	1,871,748	1,848,742
General and miscellaneous—other	2,108,764	2,071,698
Taxes	3,560,000	2,900,000
Total expenses	$48,961,067	$48,231,495
Residue receipts	*$13,430,555	*$13,393,256
Dividend:		
Chicago Railways Company—60 per cent	*$8,058,333	*$8,035,953
South Side Lines—40 per cent	*5,372,222	*5,357,302

*Includes city's 55 per cent of net divisible receipts, as defined by ordinances.

COMPARISON SHOWING GROWTH OF SYSTEM SINCE UNIFICATION

	1929	1915	Per Cent Increase
Gross earnings	$62,391,622	$31,966,049	95.18
Operating expenses	$48,961,067	$19,889,276	146.17
Taxes	$3,560,000	$1,439,279	147.35
Operating wages paid	$30,348,351	$10,560,039	187.39
Total wages paid	$33,295,118	$12,379,615	168.95
Revenue passengers carried	892,814,620	627,731,550	42.23
Total rides	1,621,215,876	1,115,312,129	45.36
Average fare per revenue passenger	6.90c	4.99c	38.28
Average fare per ride	3.80c	2.81c	35.23

TRACK MILEAGE OF CHICAGO SURFACE LINES

During the fifteen-year period of unification the companies have constructed 122 miles of new extensions (single track equivalent) at a cost of $6,683,715 and reconstructed 553 miles of single track at a cost of $33,622,017 of which $25,498,790 was paid out of the renewal funds and $8,123,226 was new capital. Track mileage of all companies, compared with the previous fiscal year, is as follows:

	Total Miles Single Track 1-31-28	Extensions 1928	Abandoned 1928	Net Extensions 1928	Total Miles Single Track 1-31-29	*Reconstructed 1928
Chicago Railways	597.09	0.42	0.01	0.41	597.50	20.48
Chicago City Railway	339.01	0.15	....	0.15	339.16	12.36
Calumet & South Chicago Railway	128.05	0.07	....	7.00	128.12	4.20
The Southern Street Railway	17.45	....	....	....	17.45	.....
Total	1081.60	0.64	0.01	0.63	1082.23	37.04

*Includes track taken up and replaced on account of sewers, special straight track renewals, etc.

taxes, $500,000 expended in premiums for life, health and disability insurance for all employees and $250,000 more paid out in increased trainmen's wages.

While all of this is most gratifying it is but an indication of the greater service these properties could render in this community under adequate franchise provisions, permitting their co-ordination with other transportation agencies and the building up of a comprehensive system. Fortunately, some progress is being made in this direction and it is the hope that the near future will see the laying of the foundation for development here of the greatest local transportation service in the world.

Accident prevention work during the year resulted in a decrease of 12 per cent in fatal accidents, making a total reduction of 25 per cent for two years. The number of fatalities was the lowest since 1914, notwithstanding the increase of 45 per cent in the number of riders since that time.

A new world's record for the operation of every car on five successive days was established on Dec. 17 to Dec. 21 inclusive when 3,639 cars were in service.

No Abandonment in Piqua

Announcement has been made by the Dayton & Troy Traction Company that no attempt is to be made at present to eliminate the electric railway system in Piqua, Ohio. Several weeks ago it was stated that the company would petition the City Council for permission to cease operating the Piqua service, due to an alleged loss of $1,000 a month. The franchise to operate the Piqua lines is combined with the franchise permitting the company to operate its interurban system through the city.

Purchase of Oklahoma Belt Line Proposed

The Oklahoma Railway, Oklahoma City, Okla., has applied to the Interstate Commerce Commission for authority to acquire by lease and purchase of capital stock the Oklahoma Belt Railway, a 5-mile line in Oklahoma City. The applicant, an electric line, controls the belt railway, for which it paid $25 a share for 5,910 shares. As indicated previously in the ELECTRIC RAILWAY JOURNAL, the belt line will be electrified.

Successor to Company in New York City Organized

The Second Avenue Railroad Corporation, New York City, has been chartered by the Secretary of State as a reorganization of the Second Avenue Railroad with capital of 34,000 shares no-par value stock. George E. Warren, Stamford, Conn., John F. B. Mitchell, Flushing, N. Y., and C. Lansing Hays, Brooklyn, are directors and subscribers. Merrill, Rogers, Gifford & Woody, New York City, are attorneys for the corporation. Approval of the terms of the reorganization by the Transit Commission was noted recently in the JOURNAL.

Railway Serving Rockaway Resorts to Be Scrapped

Valued in 1927 at $350,000, the Ocean Electric Railway, which carried passengers from Rockaway to various parts of the peninsula for 25 years, has been sold for $500 to H. E. Salzburg, Manhattan dealer in electric machinery. The Long Island Railroad operated the Ocean Electric. It reported that the contract called for complete removal of all the equipment within 90 days. Mr. Salzberg declared he had bought the franchise rights on the Belle Harbor-Rockaway Park and the Far Rockaway sections for $33. At present the peninsula is served by bus lines.

Appraisal in Kansas City

The Public Service Commission issued an order on March 12 directing its engineers to appraise the properties of the Kansas City Public Service Company, Kansas City, Mo., and requiring its accountants to audit the company's books. This is the usual procedure following an application for a new schedule of increased fare. Action on the schedule sought will be delayed 120 days to permit the appraisal and audit to be completed.

Eastern Massachusetts Elects

At the annual meeting of the Eastern Massachusetts Street Railway stockholders, Edward M. Hamlin and E. Sohier Welch were elected directors, filling vacancies caused by the retirement of H. R. Hardwick and Frederick H. Baird.

The stockholders voted to change dates of the payment of dividends on the first preferred, sinking fund, preferred "B" and adjustment stocks from semi-annual to quarterly dates. The first preferred, sinking fund, and preferred "B" stocks will be payable Fed. 1, May 1, Aug. 1, and Nov. 1. Dividends on the adjustment stocks will be payable the first day of January, April, July and October, except in April, 1929, when a semi-annual dividend of 2½ per cent will be paid. The company has declared an initial dividend of 37½ cents on the common, payable on April 1 to stock of record, of March 15.

Lester Watson, director and trustee, said that the management has made every effort to counteract this decline and is going ahead with increased use of buses. He said that fare reduction might in some cases stimulate riding and that the management was now considering a radical change in this direction on one of its divisions.

Encouraging Report to Stockholders of Michigan Line

In spite of a parallel bus line competition, the United Suburban Railroad, Grand Rapids, Mich., successor to the defunct Holland & West Michigan Interurban Company, had a successful year in 1928. Plans for improving the service during the coming year were made at the recent annual meeting.

Additional Stock for Springfield Construction Program

An increase of $500,000 in the 6 per cent preferred stock of the Illinois Power Company, Springfield, Ill., was authorized on March 8 at the annual meeting of the stockholders. The additional stock, which increases the capital stock of the company from $1,500,000 to $2,000,000, will be sold to the public to provide funds for the $800,000 construction program of this year. Approval of the Illinois Commerce Commission must be secured for the increase in the capital stock.

A. D. Mackie, first vice-president and general manager, reported gross earnings of $2,732,116 for the year 1928, an increase of $105,000 more than the previous year. The sum available for the surplus was $185,970, after all operating expenses, taxes, bond interest, depreciation, dividends and retirement of preferred stock had been paid. Depreciation took $150,000 and taxes $187,534. He also explained that the surplus was almost exhausted by repairs following the big sleet storm of December, 1924. The report showed that 3,380 stockholders were paid dividends amounting to $228,246.

In the transportation department, 1,100,000 fewer persons were carried in 1928 on the street cars and buses than in 1927.

During the past year improvements costing $474,000 were financed by the sale of 6 per cent preferred stock. Indebtedness was decreased by $53,000, that amount of the 7 per cent securities being retired.

Line to Be Abandoned in Buffalo

The Public Service Commission on March 12 approved the declaration of abandonment by the International Railway, Buffalo, N. Y., of its shuttle line in Best Street between Genesee and Elm Streets, a distance of 7,320 ft.

New Chairman of Directors in Columbus

Benjamin W. Marr, for ten years a director of the Columbus Railway, Power & Light Company, Columbus, Ohio, has been elected chairman of the board of directors and chairman of the executive committee of that company. Mr. Marr will have complete charge of the company's affairs and will direct its policy in relation to the public. Since assuming the duties of his office, Mr. Marr has stated that the proposed increased rates will not go into effect without the city's sanction. He also stated that the books of the street railway would be open to anyone the city wished to employ to examine them.

Personal Items

Promotions in Cincinnati

Joe R. Ong in charge of research; Harley L. Swift, assistant general manager; Jesse E. Carnes, assistant superintendent of transportation

THREE new directing positions have been created in the operating section of the Cincinnati Street Railway, Cincinnati, Ohio. The positions are, director of research, filled by Joe R. Ong, formerly transportation engineer; assistant general manager, filled by Harley L. Swift, formerly superintendent of substations; and principal assistant superintendent of transportation, filled by Jesse E. Carnes, formerly superintendent of motor coach operation.

Jesse E. Carnes

Harley L. Swift

Joe R. Ong

The changes made necessary by these appointments were as follows: H. C. Genrich was promoted from chief electrician to superintendent of substations; Homer H. Sorter was promoted from coach supervisor to superintendent of motor coach operations.

Howard Nestor, formerly a supervisor, has been made assistant superintendent of transportation in charge of night operation, while N. Wickersham continues as assistant superintendent of transportation in charge of day operation.

Carl J. Wendt has been made superintendent of schedules. He had formerly been assistant in the office of the transportation engineer.

In commenting on these appointments, Walter A. Draper, president, said:

> These changes are made necessary by the expanding business of the system and the continued need of more modern methods. Research plays an important part in all business of today and the experimentation with types of equipment and the study of scientific and adequate schedules has made necessary the research department. The complete reorganization of the power system with nineteen instead of the previous smaller number of substations and the proper correlation of the street car and motor coach branches of the transportation department required an organization in which the duties were more definitely outlined.

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P. M. Wentworth Honored by Stone & Webster

P. M. Wentworth, of Orlando, Fla., has been named district manager of the companies comprising the southeastern district under the executive management of Stone & Webster of Boston. The companies include the Jacksonville Traction Company, Key West Electric Company, Tampa Electric Company, Columbus Electric & Power Company, Savannah Electric & Power Company, the Florida Motor Lines, the Orange Belt Motor Lines, the Orlando Rapid Transit Company and the South Terminal Company. Since 1927 Mr. Wentworth has been executive vice-president of the Florida Motor Lines and affiliated companies, moving to Orlando from Sidney, Nova Scotia, where he was manager of the Cape Breton Electric Company, Ltd. Mr. Wentworth will maintain his headquarters at Orlando.

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Personnel of Los Angeles Company

Officers of the Pacific Electric Motor Transport Company, Los Angeles, Cal., are C. W. Cornell, president; L. B. Young, manager; L. E. St. John, secretary-auditor, and J. L. Smale, treasurer.

This company was organized to provide a complete store-door, pick-up and delivery freight transportation service in co-ordination with existing rail lines, particularly the Pacific Electric Railway, referred to recently in the JOURNAL.

◆

WALTER J. MCCARTER has been appointed to a newly created position with the title of assistant educational director of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis. He will continue as supervisor of training in the transportation department.

O. C. Wright Succeeds Michae O'Brien in St. Louis

Under a recent reorganization of i
equipment and shops divisions, O.
Wright becomes general superintende
of equipment St. Louis Public Servic
Company, St. Louis, Mo. He succeed
Michael O'Brien, retired. Mr. O'Brie
as master mechanic, was in charge of th
shops.

With the exception of Mr. Gra
other officials mentioned in the chang
in the equipment department have bee
in the company's service for some tim
They are:

Shop Superintendent C. M. Gray, wh
formerly was shop superintendent f
the Pennsylvania Railroad, Indianapoli
Ind.

Superintendent of Car Statio
A. Riley, who will have charge of t
repair work at the various car statio
on the system.

Automotive division in charge
Adam Ebinger, superintendent
garages.

Engineer of Equipment C. W. Youn
who will have charge of the drawi
rooms and engineering work.

Engineer of Tests M. M. Ridker, w
will direct all test work and chemic
analyses.

Almost immediately upon leaving co
lege Mr. Wright entered the employ
the Pennsylvania Railroad at Columbu
Ohio, as a special apprentice in t
maintenance of equipment departme
He finished the four-year course of a
prenticeship at Fort Wayne, Ind. Fi
ishing his apprenticeship he he
various positions in the Pennsylvania
organization; he was electrical engine
and engineer of motive power at Pit
burgh, Pa.; for eight months he serv
as master mechanic at the Logansp
Ind., shops and then was made divisi
superintendent at Cambridge, Oh
Next he served one year as superi
tendent of motive power at Chicago. F
four years he was district mast
mechanic at Fort Wayne, Ind., wi
three divisions under his jurisdictio
Later he went to Indianapolis. Goi
with the St. Louis Public Service Co
pany, Mr. Wright devoted the
mainder of 1928 to a study of the co
pany's equipment problems under Sa
Greenland, whom he had served
Indiana.

Mr. Wright was born at Marion, In
on June 20, 1883. He received h
primary grade and high school traini
in the public schools of his home cit
Later he attended Purdue Universi
School of Electrical Engineering fro
which he was graduated in 1905.

Under the old plan of organization t
master mechanic reported directly to t
assistant general manager. Mr. Wrig
who came to the Public Service Co
pany from the Pennsylvania Railroad
May, 1928, will have direct supervisi
over the company's shops and will n
only keep the present equipment in ser
ice, but will design new equipment a
direct any construction program und
taken by the company.

Mr. Wright's predecessor, Mich

O'Brien, will enter private practice with his son, Edward J. O'Brien, a consulting mechanical engineer. Michael O'Brien was born in the city of St. Louis. After serving an apprenticeship as a machinist in the shops of Smith-Beggs & Rankin, Corliss engine builders of St. Louis, he became, in 1889, assistant power house engineer of the Citizen's Railway, now part of the St. Louis Public Service Company, and one of the first St. Louis horse car lines to adopt the cable. After eighteen months in this position he resigned to become deputy boiler inspector of the city of St. Louis, but after one year as boiler inspector he returned to the Citizens Railway as chief engineer of its cable power house. In 1896, when the cable was discarded for electricity, Mr. O'Brien became master mechanic of the company.

In 1900, Capt. Robert McCullough, who had been president and general manager of the Citizen's Railway, went to Chicago as vice-president and general manager of Chicago's southside surface lines. He shortly took from St. Louis, Mr. O'Brien, as master mechanic of the Chicago property and Harvey B. Fleming as chief engineer. In 1904, just before the St. Louis World's Fair, Captain McCullough returned to St. Louis as vice-president and general manager of the St. Louis Transit Company and Mr. O'Brien was brought back to St. Louis as master mechanic.

Since 1904 Mr. O'Brien has been continuously master mechanic of the St. Louis Transit Company and its successors, the United Railways, the receiver of the United Railways and the St. Louis Public Service Company.

D. P. McConnell With Public Service

Daniel P. McConnell, long in newspaper work, has become identified with the publicity department of the Public Service Railway, Newark, N. J.

His newspaper career was interrupted when he was appointed deputy commissioner of parks and public property at Camden, in May, 1927. Mr. McConnell resigned his city position to accept the job of publicity assistant for the southern division with headquarters in Camden.

Entering the newspaper field when 17 years old, Mr. McConnell spent 16 years with the old Camden *Post-Telegram*. He was also court and legal reporter for the *Evening Courier* for a few months and represented the Philadelphia *Public Ledger* in Camden for eight years. At one time he was sports editor of the *Post-Telegram*.

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George R. True, a member of the claims department of the Chicago Rapid Transit Company, Chicago, Ill., for the past eighteen years, was recently appointed claims agent for the company. He began his service with the elevated lines in 1911 as claims adjuster. Prior to that time he had been engaged in newspaper work in New York City.

G. M. Gadsby Heads Utah Property

George M. Gadsby has been made vice-president of the Utah Light & Traction Company, Salt Lake City, Utah, succeeding D. C. Green. Mr. Gadsby is also the new president and general manager of the Utah Power & Light Company. Early in the present year he resigned as president of the West Penn Power Company to become associated with the Electric Bond $ Share Company, New York. He had spent more than ten years with the West Penn system at Pittsburgh.

Mr. Gadsby obtained his first practical engineering experience as chemist with the water department at Marietta, Ohio, and early in his career was employed as chemist for the Warren Water Company, a subsidiary of the American Water Works & Guarantee Company at Warren, Pa. From there he went to Pittsburgh, subsequently to Little Rock, Ark., and later to New York. Two years later—in 1917—Mr. Gadsby returned to Little Rock to engage in business, but before he had established himself he was requested to return to Pittsburgh as assistant to A. M. Lynn, president West Penn Power Company.

G. M. Gadsby

While engaged in public utility work in Pennsylvania he has been very active in association affairs. He has also acted for two years as chairman of the special power survey committee representing the Pennsylvania Electric Association in work with the "giant power" survey board and work in conjunction therewith by the Public Service Commission.

H. Hobart Porter Honored

H. Hobart Porter, engineer and industrialist, has been elected chairman of the Engineering Foundation, 29 West 39th Street, to succeed Lewis B. Stillwell. The new chairman is president of the American Water Works & Electric Company and of the Brooklyn City Railroad. He is chairman of the board of the West Penn Electric Company and is vice-president of the Queensboro Gas & Electric Company. He is a director of several power companies and railways.

OBITUARY

George D. Walden, assistant superintendent of tracks United Electric Railways, Providence, R. I., from 1917 until July, 1927, died recently. Early in his career he entered the employ of the Metropolitan Street Railway, Boston, becoming in time assistant superintendent and finally division superintendent of transportation. During this time the Metropolitan Company was consolidated with the West End Street Railway. Mr. Walden went to Providence as a track foreman in May, 1904. During his years of services he had charge of special track work in Pawtucket, on the Providence-Woonsocket line and later assisted in city installation work in Providence.

James A. Dorsey, for many years superintendent of lines Connecticut Valley Street Railway, died in his home in Northampton, Mass., on Feb. 22, at the age of 60 years. After concluding his service with the Connecticut Valley system he was employed by the Boston & Albany Railroad for ten years.

Matthew Griswold, who retired as manager of the Erie Works of the General Electric Company on Jan. 1 of this year because of ill health, died on Feb. 10. On Nov. 11, 1911, he severed his connection with the Griswold Manufacturing Company to become acting manager of the Erie Works of the General Electric Company. He was made manager of the plant on Dec. 12, 1912. Mr. Griswold was born in Erie in 1866. He was graduated from Sheffield Scientific School, Yale, in 1888.

John A. Guiher, prominent northeastern Iowa attorney, former member of the State Railroad Commission, and remembered in utilities circles for his association as arbitrator in the dispute between the Des Moines Railway and its employees in 1907, died Feb. 26 in Miami, Fla. Mr. Guiher recently was special master-in-chancery in settlement of dispute between the Des Moines Union Railway and the Hubbell interests.

Fayette S. Curtis, formerly president Old Colony Railroad and later vice-president New York, New Haven & Hartford Railroad, died at Boston, Mass., on Feb. 15. Mr. Curtis, a civil engineer in railroad work, was identified first with the Albany & Susquehanna Railroad. In 1874 he was appointed chief engineer New York & Harlem River Railroad and in 1876 was appointed to a similar capacity with the New York, New Haven & Hartford. In 1900 he was elected vice-president of the New Haven road which position he resigned in 1907 to become president of the Old Colony Railroad. Mr. Curtis was 86 years old.

J. C. Nord, for 37 years with the Denver Tramway, Denver, Col., died on March 1. For fifteen years Mr. Nord was chief clerk in its transfer office. He started in 1891 as a conductor.

Equipment Orders in Project

Seattle may purchase 80 new cars. $135,000 Substation for Baltimore. New York, New Haven & Hartford to order new passenger equipment. Improvements in Sacramento

NEGOTIATIONS for the construction of 80 new street cars for the Seattle Municipal Railway will probably be resumed in the near future, according to Councilman E. L. Blaine, chairman of the finance committee, of Seattle, Wash. The order for these cars was placed Aug. 10, 1926, but the actual construction was not started, however, because of financial conditions. The city of Seattle has recently obtained a favorable court decision in the Von Herberg suit, and has been advised that if Von Herberg will not appeal and will agree to discontinue these proceedings, that the financing of the 80 street cars will be reconsidered. The new cars are to be of lighter construction and are designed for faster acceleration and speed.

BALTIMORE SUBSTATION

The United Railways & Electric Company, Baltimore, Md., will start work in the near future on a new substation to be erected at White and Glen Oak Avenues. It will cost approximately $135,000 and will enable the company to improve its facilities in the Hamilton, Blair Road and Carney sections. The station will be of the manually operated type, and considerable attention will be given to the construction of the building. The actual cost of the building is estimated to be approximately $26,000. This substation is scheduled to be completed by the last of June.

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has placed in service a new $40,000 sheltered loading station for street cars and motor buses at 27th and Hopkins Streets. The station is on private property, extending from Hopkins Street to 27th Street, a distance of about 100 ft. east of the intersection. Double-loop tracks accommodate 12th and 27th Street cars, and a drive is provided for North Milwaukee buses. A small building on the property will contain a light lunch concession. The opening of the station is said to clear up one of the most serious traffic conditions in the city.

SACRAMENTO IMPROVEMENTS

The Pacific Gas & Electric Company, San Francisco, Cal., has announced provisions of the 1929 budget of the company, calling for the purchase of seven new street cars of the latest design and thirteen passenger buses for use in Sacramento, as well as the construction of a new substation and extensive additions and improvements to present facilities.

The entire expansion program in the Sacramento district calls for a total expenditure of $1,848,995. The separate items projected for consummation here this year are:

Seven new street cars for use in Sacramento, $91,000; seven 40-passenger coaches, $79,000; four 29-passenger coaches, $34,000; two 21-passenger coaches, $12,000; new substation in southeast Sacramento, $110,000; extension of lines to serve the new substation, $65,000; rebuilding of facilities in substation A at Sixth and H Streets, $62,000, and new paint shop at 29th and M Streets, $15,300.

The passenger coaches and buses likewise will be in operation in the outlying residential districts of Sacramento as extension service from street car lines.

The $110,000 substation in the southeastern section of the city will be started in the near future, when the $65,000 task of extending electric lines to serve the station also will be undertaken.

The $62,000 program for rebuilding the facilities in the substation at Sixth and H Streets will be commenced at once. The entire switching apparatus will be changed and a number of modern improvements and additions will be made.

The projected $15,300 paint shop at 29th and M Streets, which will be used for painting street cars and buses, will be started soon. Plans for the building are being prepared. It will be of brick construction and probably about two stories high.

The United Electric Railways, Providence, R. I., has just completed the installation of a 3-in. gasoline pipe line at its Elmwood and Melrose garages. This line runs from the siding on the Narragansett Electric Company's property on Melrose Street, through the Melrose garage and to the Elmwood garage—a distance of approximately 1,725 ft. This line will enable the company to unload a 10,000-gal. tank car in about $2\frac{1}{4}$ hours.

This company has also completed alterations in its Elmwood carhouse, whereby all of the middle section has been turned over for use by the bus department, thus providing accommodations for housing and repairing of 30 additional buses. The middle section has been remodeled to accommodate storage and repairs for 36 cars.

CARS FOR NEW YORK, NEW HAVEN & HARTFORD

The purchase of three motor cars and six multiple-unit trailer cars has been authorized by the New York, New Haven & Hartford Railroad. This is part of authorized expenditures for car equipment amounting to approximately $6,500,000. This sum includes the purchase of 90 passenger coaches, 10 combination coaches, 15 apartment mail cars, 6 diners, 20 gasoline-electric cars and 24 trailers for gasoline-electric cars.

The Public Service Co-ordinated Transport, Newark, N. J., is trying out new illuminated signaling devices, which indicate when the bus or car is about to turn either to the right or left. A bus will be equipped with two of these appliances—one on each side of the front. If the experiments now being made prove satisfactory, it is said that they will be installed on all street cars and buses in the Public Service system.

The properties of the Sacramento Short Line have been recently acquired by the Sacramento Northern Railway, Sacramento, Cal., which company has a program for the expenditure of $318,000. $86,000 of this amount is to be charged to operating expenses, and $252,000 to capital account. This does not include $600,000 required to complete the construction of the 16-mile Holland branch, which will in all probability be ready for operation about May 1. The Tidewater Southern Railway has a program calling for the expenditure of $165,000.

The Pacific Gas & Electric Company, San Francisco, Cal., will make extensions to its pole-treating and distributing plant, Stockton, Cal., to cost approximately $65,000. The Citizens Transit Company, Oil City, Pa., has placed an order for three new 29-passenger Dodge buses, at a cost of approximately $10,000 each. With the delivery of these new vehicles, the total number of buses owned by the company will be brought up to 27. The Southern Ohio Public Service Company, Columbus, Ohio, has placed an order for five 20-passenger parlor car type Studebaker buses, and two de luxe street car type Studebaker buses.

MATERIAL PURCHASES

The volume of equipment and material purchases seems to be on the continual increase. The Pittsburgh Railways, Pittsburgh, Pa., has placed orders recently for 25,000 ft. of $\frac{1}{4}$-in. copperweld span wire, 41,000 ft. of $\frac{5}{16}$-in. copperweld span wire, 12,500 ft. of $\frac{7}{16}$-in. copperweld span wire, 21,000 ft. of $\frac{1}{4}$-in. galvanized span wire, 164,000 ft. of No. 10 weatherproof copperweld solid wire, 5,000 ft. of $\frac{5}{16}$-in. galvanized span wire, 4,000 ft. of three-conductor weatherproof cable, and 5,000 No. 00 15-in. line ears. This company has also placed orders for 1,800 fir crossarms, 900 insulator pins, 1,000 12-in. bonds, 300 24-in. trolley protecting armors, 500

16-in. bonds, 400 insulators, 8 section insulators, 400 lb. of copper-coated welding rod, and 75 30-ft. creosoted yellow pine poles.

Line materials ordered by the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., include ten cars of poles, two cars of wire and cable, and one car of crossarms.

The Chicago Surface Lines, Chicago, Ill., has placed orders for 250 No. 000 right-hand malleable-iron switches and 550 No. 000 left-hand malleable-iron switches, 100 No. 000 65-ft. radius, 33-deg. malleable-iron galvanized crossovers, and 600 lightning arresters.

TRACK EQUIPMENT

Track materials ordered recently include 13,000 white oak ties, 24,000 screw spikes, 13,000 tie plates, and 285 kegs of track bolts, by the Twin City Rapid Transit Company, Minneapolis, Minn. This company has also ordered one Ingersoll-Rand type 20 portable electric driven air compressor. Other track material ordered includes 400 gross tons of 7-in. 93-lb. T-rail, 600 gross tons of 7½-in. 102-lb. T-rail, 100 gross tons of 7-in. 114-lb. guard rail, 2,000 welding portions for T-rails, one electric over steam railroad crossing, and one No. 14 S, ½-cu.yd. Smith Paver-Less railway motor.

Pittsburgh Railways, Pittsburgh, Pa., has placed orders for 1,600 tons of 7-in. 122-lb. rail, 1,600 tons of 9-in. 134-lb. rail, 10,000 ties, 300 tons of 80-lb. T-rail, 800 pair splice bars, 1,000 kegs of track spikes, 100 kegs of track bolts, 10,000 tierods, 100,000 tie plates, and 1,850 railroad crossing bolts. This company has also placed orders for 1,386 miscellaneous parts for switches and boxes, 20 sewer drops, 50 sewer drop covers, 20 kegs of tierod washers, 2 concrete cribs, and 16 pieces of special work.

CAR REMODELING

For car remodeling, the Twin City Rapid Transit Company has placed orders for 12,000 ft. of 1 x 1¼-in. Philippine mahogany lumber, 200 gear blanks, and 120 steel billets, 6½ in. square by 52 in. long. This company has also placed orders for 80 tons of pig iron and 30,000 lb. of Viscoline lubricant. The Milwaukee Electric Railway & Light Company has ordered eight second-hand cars.

The Pittsburgh Motor Coach Company contemplates the purchase of two 29-passenger parlor coaches. The Pittsburgh Railway is remodeling fifteen low-floor type cars from one-man operation to one-man, two-man operation. This company is also remodeling one high-floor double-end car from two-man operation to one-man operation.

The Chicago Surface Lines has ordered 100,000 vitrified paving brick and 300 grinding wheels. The Milwaukee Electric Railway & Light Company is constructing a substation at the Six-and-a-Half Mile Road. The Pittsburgh Railways has received one 40 series Cincinnati all-steel press brake and one power press.

Mexico Imports Equipment

Importation of street cars, poles, wire and electrical equipment through Laredo, Tex., into Mexico showed a material improvement over 1927, according to a report recently completed by customs officials. During 1928 45 carloads of trolley cars were imported through Laredo, in addition to 38 carloads of poles, and 17 carloads of electrical supplies. A total of 26 carloads of wire was also imported by this country, as well as rails, wheels and miscellaneous items.

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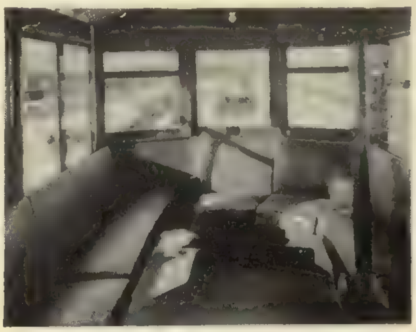
Beech Grove Car Delivered

The Beech Grove Traction Corporation has received a one-man motor, city type, passenger car from the Cincinnati Car Company, Cincinnati, Ohio. Mention of the order of this car was made in Nov. 3 issue of ELECTRIC RAILWAY JOURNAL. The car is of the single-end, double-truck type, 39 ft., 8 in. long, weighs 25,400 lb. and seats 49 passengers.

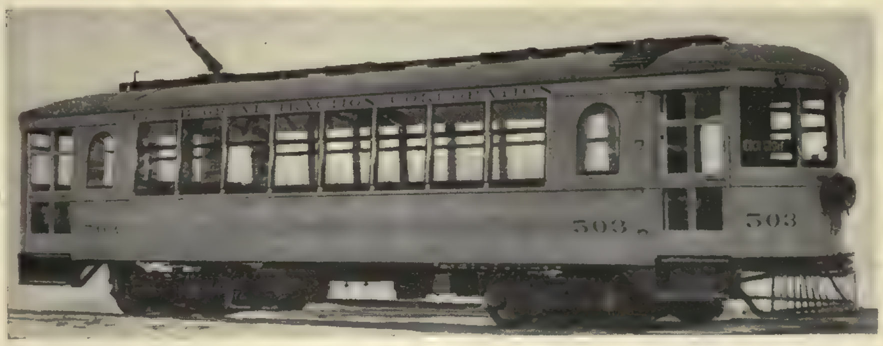
The body of this car is of semi-steel construction with an arch roof and sliding-end doors. The insulating material used is cork and the floor aisles are covered with linoleum. The exterior of the car is enamelled a chrome to the rail and an apple green to the roof. The roof is a red color. The interior trim is cherry stained walnut. The seats are attractively finished in brown Spanish leather.

The trucks are equipped with inside hung motors and 26-in. steel wheels. Plain type journal and armature bearings are used. The wheels and trucks are deadened to reduce noise. A light inside the car and a tail light are connected to a three-cell battery which operates when the trolley circuit is broken. Additional details are given in the accompanying specifications.

The interior trim is stained walnut and the seats are upholstered in brown Spanish leather



The rear end of the car is partitioned off and equipped with side seats giving a seating capacity of 49 passengers



The car recently delivered to the Beech Grove Traction Corporation, Indianapolis, Ind.

Weights:	
Car body	11,690 lb.
Trucks	7,600 lb.
Equipment	6,100 lb.
Total	25,400 lb.
Bolster centers	21 ft.
Length over all	39 ft. 8 in.
Length over body posts	30 ft. 6 in.
Truck wheelbase	5 ft.
Width over all	8 ft. $6\frac{3}{8}$ in.
Height, rail to trolley base	10 ft. $5\frac{11}{16}$ in.
Window post spacing	33 in.
Body	Semi-steel
Roof	Arch
Doors, sliding	End
Air brakes	Safety Car Devices Company
Armature bearings	Plain
Car signal system	Storage battery
Compressors	2-c p 25
Conduit	Flexible
Control	K 35
Curtain fixtures	Curtain Supply Company
Curtain material	Pantasote
Door mechanism	Consolidated
Energy saving device	Economy
Fare boxes	Cleveland
Finish	Enamel
Floor covering	Linoleum over center floor
Gears and pinions	Spur
Glass	Plate
Hand brakes	Cincinnati Car Company
Heat insulating material	Cork
Heaters	Consolidated
Headlights	G.E. J. 65
Headlining	Agasote
Interior trim	Cherry stained walnut
Journal bearings	Plain
Journal boxes	3 x 6
Motors	Westinghouse No. 508, inside hung
Painting scheme	Chrome to rail, apple-green to roof and red roof
Registers	Cleveland
Roof material	Canvas
Sash fixtures	Edwards
Seats	Hale & Kilburn
Seating material	Brown Spanish leather
Slack adjusters	Gould
Steps	Stationary
Step treads	Oak, edged with aluminum
Trolley catchers	Ohio Brass Company
Trolley base	Ohio Brass Company
Trolley wheels	Slide
Trucks	Cincinnati Car arch bar
Wheels, type	Steel, diameter 26 in.
Wheelguards or fenders	Steel pilot

Specifications on Regina Cars

Seven one-man, motor, passenger cars have been ordered by the Regina Municipal Railway, Regina, Sask., from the Ottawa Car Manufacturing Company, Ottawa, Ont. These cars, mention of which was made in the Jan. 26 issue of the JOURNAL, are the single-end, double-truck, city type and seat 48 passengers. Each car weighs 34,000 lb., is 41 ft. long and 8 ft. 3 in. wide. The bodies are of all steel construction with arch roofs and folding-end doors. The interiors are trimmed in birch and the cars are finished in mahogany with cream trim.

The trucks are spaced on 17-ft. 7-in. centers and are equipped with 25-hp. motors and 26-in. rolled steel wheels. The armature bearings on all of the cars are of the plain type but only five of the cars are equipped with plain type journal bearings. Roller journal bearings are installed on two of the cars for test purposes. The cars are equipped with back-up signals and track scrapers. Additional information is given below.

Weights, car body	17,400 lb.
Trucks	10,000 lb.
Equipment	6,600 lb.
Total	34,000 lb.
Bolster centers	17 ft. 7 in
Length over all	41 ft.
Length over body posts	26 ft. 4 in.
Width over all	8 ft. 3 in.
Height, rail to trolley base	10 ft. 9 in.
Window post spacing	30 in.
Body	All steel
Roof	Arch
Doors	Folding end
Air brakes	General Electric
Armature bearings	Plain
Axles	A.E.R.A. standard 4¼ in.
Car signal system	Consolidated
Compressors	General Electric
Conduit	Flexible and metal
Control	General Electric K 35
Couplers	Portable 3 x 1¼ in.
Curtain fixtures	National Lockwasher Company
Curtain material	Pantasote
Destination signs	Colored lights also lettered
Door mechanism	Rear treadle, front manual
Energy saving device	Economy meters
Fare boxes	Cleveland
Finish	Duco
Floor covering	⅞ x 1-in. hard maple mat strip
Gears and pinions	Tool steel
Glass	Plate and non-shatterable
Hand brakes	Peacock
Hand straps	Hand rails
Heat insulating material	Cork
Heaters	Forced draft and General Electric
Headlights	Golden glow
Headlining	Agasote
Interior trim	Birch
Journal bearings	5 cars plain, 2 cars S.K.F. roller
Journal boxes	Cast iron for 3¾ x 7 in.
Lamp fixtures	Compensating
Motors	25 hp. General Electric No. 264A
Painting scheme	Mahogany, cream trim
Roof material	No. 10 canvas
Safety car devices	Semi automatic
Sash fixtures	Brass satin finish
Seats	Ottawa Car Manufacturing Company
Seat spacing	30 in.
Seating material	Rattan
Slack adjusters	General Electric
Steps	Folding
Step treads	Honeycomb
Trolley	Ohio Brass
Trolley base	Ohio Brass
Trolley wheels	Kalamazoo
Trucks	Canadian Car & Foundry Company
Ventilators	Nichols-Lintern
Wheels, type	Rolled steel, diameter 26 in.
Wheelguards or fenders	H.B. Lifeguards

Weekly Business Conditions

Commercial transactions during the week ended March 9, as indicated by check payments, was greater than in either the preceding week or the corresponding period of 1928, according to the weekly statement of the Department of Commerce. Steel plants during the same week showed larger operating activity than in either the previous week or the similar week of last year. The output of bituminous coal during the latest reported week, while somewhat lower than in the preceding week, was considerably larger than in the corresponding period a year ago. The production of lumber showed a gain over the preceding week and no change from the corresponding week of 1928. Petroleum output was running considerably in excess of last year. Freight-car loadings covering the latest week for which data are available showed a gain over the similar week of last year.

The general index of wholesale prices showed a practical decline from the previous week, but was higher than a year ago. The price of copper averaged higher than in either period, while the price for iron and steel, showing no change from the previous week, was higher than in the corresponding period of 1928. Loans and discounts of federal reserve member banks showed further expansion as compared with both the preceding week and the similar period a year ago. Interest rates on call loans averaged higher than in either period. Bond prices averaged lower than in either the preceding week or the similar period of last year.

◆

Railroad Electrification in Spain

The commission appointed by the Spanish government to decide which sections of the Spanish railroads should be electrified in the near future has decided that the following lines fall into this category: Madrid-Alvila, Madrid-Segoria, Medina, Valencia-Cuenca; Madrid-Villanueva de la Reina; the lines in Catalonia, Valencia-Encina; Miranda-Bilbao and the line from Santander to the Pyrenees. The length of the lines in question is approximately 1,375 miles and it is estimated that 150,000 hp. will be required for their operation. Electric trains are already running on the Pajares railway, the Barcelona-Manresa-St. Jeandes Abesses and the Bilbao-Arenas lines. The electrification of the Ripoll-Puigcerda, and Estella-Vitoria-Alsasua lines has been completed and electric trains will shortly be in operation.

Weekly Business Indicators

(Weeks ended Saturday. Average 1923-25 = 100)

	1929				1928			
	Mar. 9	Mar. 2	Feb. 23	Feb. 16	Mar. 10	Mar. 3	Feb. 25	Feb. 18
Steel operations	122.4	118.4	117.1	114.5	108.0	109.0	111.0	112.0
Bituminous coal productions	.....	114.5	120.6	122.5	106.6	103.0	104.4	96.2
Lumber production	.....	101.4	96.4	84.1	99.1	101.4	108.6	106.4
Petroleum production (daily average)	.....	129.8	129.3	128.4	113.1	113.2	112.8	113.4
Bldg. contracts 37 states (daily average)	.....	124.5	93.1	85.1	110.0	111.0	122.2	114.9
Price iron and steel, composite	87.9	87.9	87.6	87.6	87.6	86.5	86.0	86.0
Copper, electrolytic, price	.....	139.1	129.0	129.0	100.7	100.0	100.0	100.0
Check payments	157.8	124.8	145.5	119.1	126.6	123.7	105.3	110.1
Bank loans and discounts	131.4	130.9	129.5	129.9	121.2	121.2	120.4	121.1
Interest rates, call money	218.2	187.9	169.7	169.7	103.0	109.1	103.0	109.1
Business failures	120.4	131.9	101.0	117.0	125.3	126.8	118.7	127.8
Interest rates, time money	177.1	177.1	177.1	177.1	105.7	105.7	105.7	105.7
Federal reserve ratio	89.9	90.2	91.4	90.1	96.0	95.6	96.4	95.5

METAL, COAL AND MATERIAL PRICES F.O.B. REFINERY

Metals—New York	March 12, 1929
Copper electrolytic, cents per lb.	19.775
Copper wire, cents per lb.	21.625
Lead, cents per lb.	7.25
Zinc, cents per lb.	6.7
Tin, Straits, cents per lb.	48.375
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.425
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.80
Franklin, Ill., screenings, Chicago, net tons	1.425
Central, Ill., screenings, Chicago, net tons	1.075
Kansas screenings, Kansas City, net tons	1.70
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	$6.35
Weatherproof wire base, N. Y., cents per lb.	22.375
Cement, Chicago net prices, without bags	2.05
Linseed oil (5-bbl. lots) N. Y., cents per lb.	10.6
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.5
Turpentine (bbl. lots), N. Y., cents per gal.	63.5

To Exhibit Waste-Campaign Facts

A nation-wide chain of individual industrial exhibits for employees and officials will be an educative feature of waste-campaign week in April. A booklet, describing exhibit campaigns of the Westinghouse Electric & Manufacturing Company, and the Newport News Shipbuilding & Drydock Company, is being distributed to more than 200 manufacturing plants by the local sections of the American Society of Mechanical Engineers and every section is trying to have the plants in its vicinity stage such a campaign in April.

◆

Woodruff Key Standard Proposed

A proposed American standard for Woodruff keys, keyslots and cutters has been recently completed by a subcommittee of the sectional committee on the standardization of shafting. This proposed American standard is now being submitted to the sectional committee for approval. The standards are in tentative form for discussion and suggestions will be welcomed by the committee. They should be mailed to C. B. LePage, assistant secretary, The American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.

Safety—

Plus

A car with good air brakes is considered safe, but for emergencies a set of hand brakes is provided. But what if the hand brakes fail, due to no fault of their own—because of worn brake shoes or slack rigging? What then?

A hand brake that allows for this last condition, that functions in spite of poorly adjusted rigging or worn shoes—such is Peacock Staffless. That's why it gives not only safety, but "safety-plus."

Its special construction permits Peacock Staffless to wind up twelve feet of chain without clogging. You will readily appreciate that this is more than enough to take care of the maximum slack encountered in operation.

Besides this feature, Peacock Staffless also has four others—light weight, small platform space requirements, low maintenance, great speed and power. All these combine to make this brake a safe buy for old cars as well as new.

"PEACOCK"
REG. U. S. PAT. OFF.

STAFFLESS BRAKES!

National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

Canadian Representative:
Lyman Tube & Supply Co., Ltd., Montreal, Can.
General Sales Representatives:
The Ellcon Co., 50 Church St., New York

The
Peacock
Staffless

This MARK *is your* GUARANTEE

Look for the word "Empire" on oiled electrical insulations! It is your guarantee of uniform high quality, of an insulation that successfully withstands the ravages of time.

Only the finest of linseed oil, the strongest, most uniform of cloths, and papers are used. Rigid inspection assures this. Manufacture has been perfected to such an extent that the original high dielectric strength and flexibility of Micanite electrical insulation is retained indefinitely.

If you require cloth, silk, paper or any of the other oiled insulations be sure to ask for "Empire"—the age resisting electrical insulation.

Empire Oiled Insulations: Super-Micanite, and Micanite bonded mica insulation. Mica Insulating Varnishes, Compounds, Cements, Friction and Rubber Tapes are products of the Mica Insulator Company.

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PERFECT MICANITE INSULATOR
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Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

Make Way for Progress

Suddenly, at the turn of the highway, the motorbus appears › › The light flashes on its colorful sides, its spotless brightwork, its wide glass windows › › High of power, low of body, rhythmically balanced to the road, it strides the curves and straightaways with an easy, conquering speed › › Some of its passengers wave as they pass; others read, work on business affairs, or doze—all deep cushioned in the luxury of this new travel › › Swift, convenient, reliable, comfortable, the new great carrier draws cities closer, banishes isolation, quickens commerce. THIS IS PROGRESS!

› › ›

THE astonishing growth of motorbus service to the point where one may now take a bus to a neighboring village or just as easily to a city across the continent, is steadily accompanied and often pioneered by the development of Goodyear Pneumatic Cord Bus Tires.

The part these dependable tires play in the rapid expansion of motor transport is witnessed by an impressive preference for Goodyear Tires throughout the industry.

Exclusive equipment on the great urban, interurban and transcontinental fleets that number their buses by hundreds, Goodyear Tires also carry the single buses that cover the short branch routes or gather the children for rural schools.

They are thus uniformly favored because they are built with an understanding of motorbus operation and its needs. They have the essential qualities for passenger satisfaction and operating profit:

Freedom from trouble on the road—

Tractive power for starting and stopping—

The safe, sure, anti-skid grip of the famous All-Weather Tread—

The body vitality of extra-elastic, extra-durable SUPERTWIST Cord, insuring uninterrupted revenue mileage over a long life at low tire cost per mile.

Superior as they are for motorbus service, Goodyear Tires cost no more to buy and much less to operate.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, specially built to motorbus needs, and also Goodyear Rubber Tire Chains.

The Greatest Name in Rubber

GOODYEAR

Copyright 1929, by The Goodyear Tire & Rubber Co., Inc.

This advertisement also appeared in the March 2nd issue of the Saturday Evening Post, in full colors

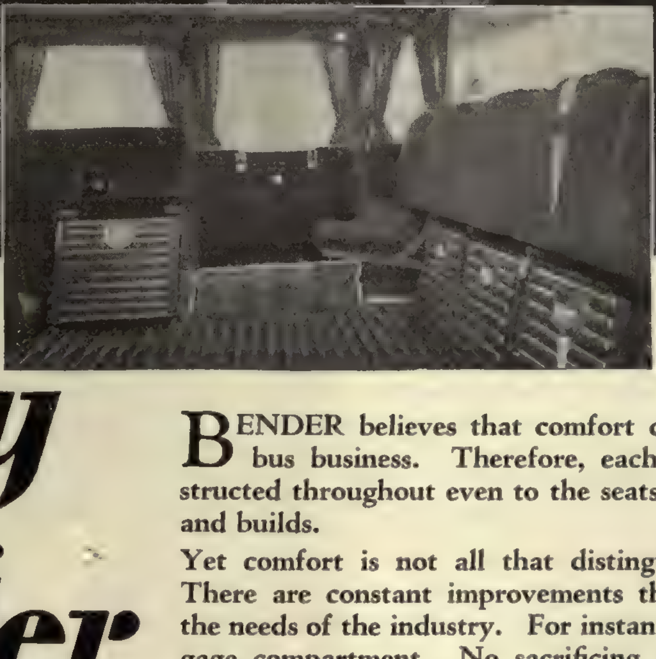
Comfortably right and economically right

Timken Worm Drive for electric railway cars

For those who look for comfortable transportation, for those who look for profits—from both points of view, Timken Worm Drive for electric railway cars is fundamentally practical. A dead silent, sturdy, long-lived driving unit; light weight high-speed motors; long, flat, comfortable springs; smooth starting and acceleration—smooth stopping; differentials for quiet, and prolonged life of wheels and rails—these are all definite contributions to comfort and profit, by Timken Worm Drive Car Trucks.

DTA CO

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.



Note convertible compartment for trunks and other baggage—a wonderful convenience. Readily changed for comfortable seating of passengers or loading of bulk luggage.

UNION PACIFIC SYSTEM
THE OVERLAND ROUTE

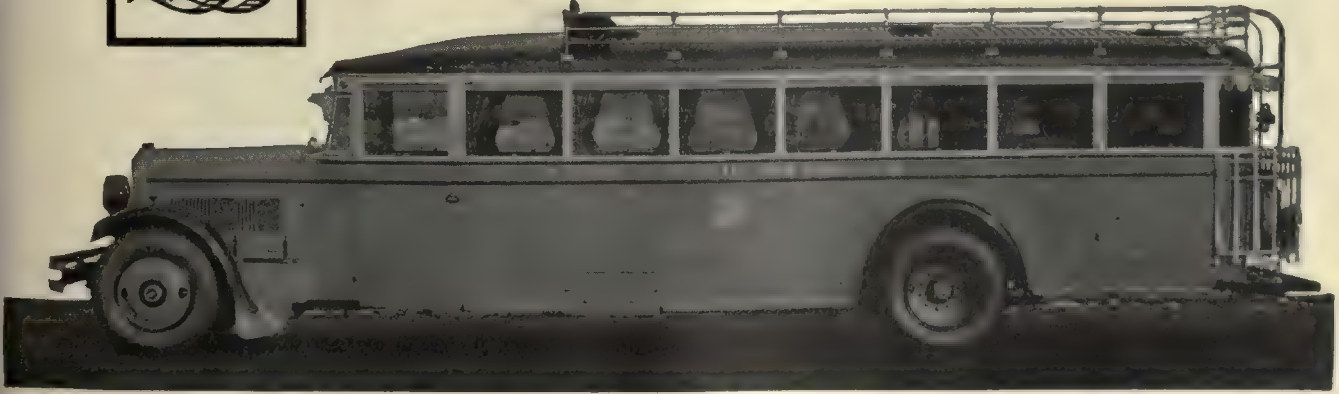
Body ...by... Bender

BENDER believes that comfort comes first in building bus business. Therefore, each body is Bender constructed throughout even to the seats which Bender designs and builds.

Yet comfort is not all that distinguishes Bender Bodies. There are constant improvements that actually anticipate the needs of the industry. For instance, the convertible luggage compartment. No sacrificing of inside space—good head room.

Before deciding on any bus job it will pay you to talk to Bender.

THE BENDER BODY COMPANY
W. 62nd and Denison, Cleveland, Ohio



mileage

FISK Motor Coach Balloons give super service and comfort because they are built a better way—by Fisk's original *All-Cord* process!

This unique construction eliminates internal friction and overheating; saves all the strength of these tough tires to fight the wear of the road. As a result, Fisk Tires wear slowly and evenly, piling up excess *mileage* that helps you pile up profits.

THE FISK TIRE COMPANY, INC.
Chicopee Falls. Mass.

FISK

MOTOR COACH BALLOON

How do you figure low cost?

per coach?
per hour?
per mile?
per passenger?

Your costs are lo
operat

DODGE
BROTHERS

CHRYSLER MOTORS PRODUCT

DODGE
MOTO

SOLD BY DODGE BROTHE

n any basis–if you
odge Coaches

Investment is small, you save on depreciation and operation and maintenance charges are low on 21-Passenger street car type Dodges.

Many operators have made their second and third purchases of Dodge Brothers 21-passenger motor coaches — some operators their fourth and fifth.

Their fleets number up to and over 300 coaches. Their experience is important to all operators. Their reasons for repeated purchases of Dodges can be summarized as follows —

Power aplenty in the 6-cylinder engine. Excellent flexibility in the use of this power with 4-speed transmission. Safety of hydraulic 4-wheel brakes. Riding ease of 3-stage rear springs. Comfortable seats properly arranged. Fine appearance — everything a modern motor coach should be or have . . . . .

And all this at minimum cost—whether you figure cost per mile, per hour, per coach or per passenger.

ROTHERS
OACHES

EALERS EVERYWHERE

New class of riders wants parlor coach

Dodge Brothers 16-passenger Parlor Coaches continue to build up that new class of riders who want something between the street car and high price transportation. ¶ This class of rider is growing. Dodge Parlor Coach sales are growing. ¶ This service is only one of a score of uses in which Dodge Brothers Parlor Coaches and 12-passenger Club Coaches are operating profitably.

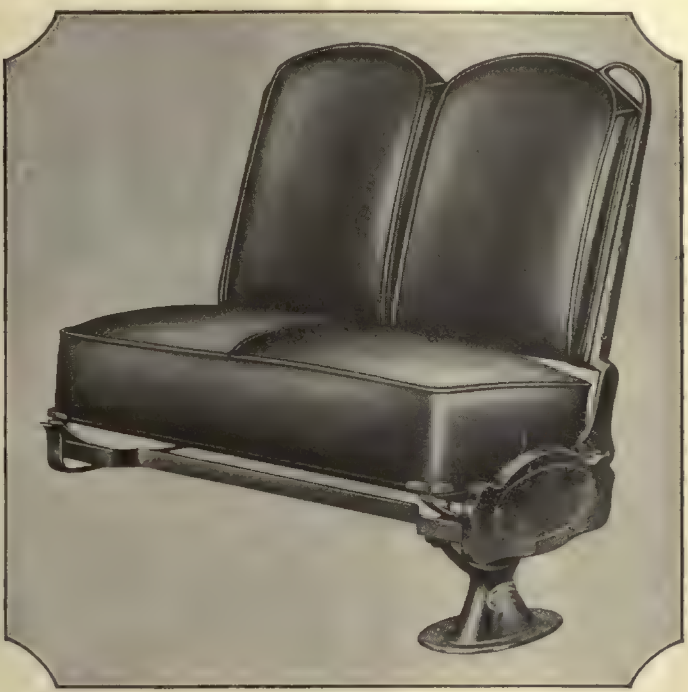
**DODGE BROTHERS
MOTOR COACHES**

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

B-1164 Printed in U. S.

102 YEARS OF MANUFACTURING EXPERIENCE

Rattan car seat webbing may be ordered through any H-W sales office



No. 327-M

FOR INTERURBAN NEEDS

THIS Heywood-Wakefield seat is designed for the modern type of interurban service where comfort is now so important. It has been selected for both new cars and for replacement use.

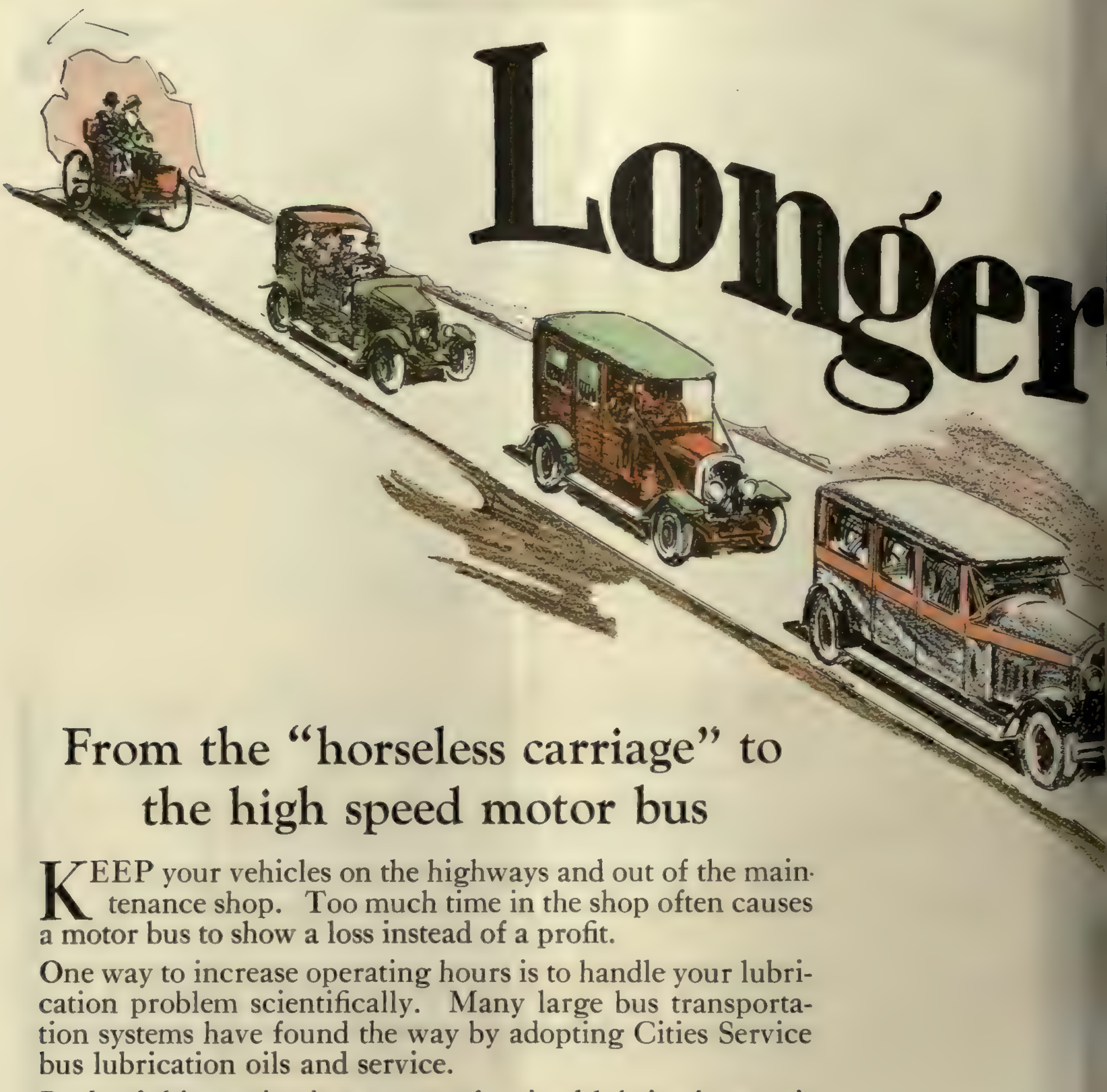
It has deep, double spring cushions shaped to allow more leg freedom. Mechanism rails are set in. The individual backs are properly pitched for comfort.

Our car seating experts will be glad to help you decide on the best seating equipment for your needs. This service is free through any H-W sales office.

If you have not received a copy of our new Bus Seat Catalogue, write for it.

Heywood-Wakefield
REG. U.S. PAT. OFF.

Heywood-Wakefield Company, Wakefield, Mass.; 516 West 34th St., New York, N. Y.; 439 Railway Exchange Bldg., Chicago, Ill. H. G. Cook, Hobart Bldg., San Francisco, Cal. The G. F. Cotter Supply Company, Houston, Texas. John R. Hayward, Liberty Trust Building, Roanoke, Va. The Railway & Power Engineering Corp., 133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada.



From the "horseless carriage" to the high speed motor bus

KEEP your vehicles on the highways and out of the maintenance shop. Too much time in the shop often causes a motor bus to show a loss instead of a profit.

One way to increase operating hours is to handle your lubrication problem scientifically. Many large bus transportation systems have found the way by adopting Cities Service bus lubrication oils and service.

Back of this service is a group of trained lubrication engineers who have studied motor developments and problems from the earliest days.

Their solution of the bus lubrication question was characteristically scientific. They gained a thorough knowledge of motor bus operation and lubrication through practical work and research on thousands of buses, operated under every conceivable condition. Then they developed a pure petroleum product specially processed to meet the requirements of high speed, heavy duty, bus motors.

Insure "longer mileage life" for your vehicles by lubricating with our recommended grades of Koolmotor Bus Oils.

Mileage Life

Koolmotor Bus Oils are carefully refined from 100% Pennsylvania crude base for the special requirements of heavy duty, high speed motor bus lubrication. The method used in refining them is based on the findings of the highly trained corps of Cities Service lubrication engineers who are always on the alert to change refining formulas or develop new ones to accommodate ever changing lubrication conditions.

OIL DIVISION
CITIES SERVICE COMPANY
60 WALL STREET, NEW YORK, N. Y.
Koolmotor Products

The GENERAL
TIRE

~goes a long way
to make friends

It's the **NON-STOP**
MILEAGE *that makes*
the big hit ~ ~ ~ ~

THE GENERAL TIRE AND RUBBER COMPANY, AKRON, OHIO

Good *Motor Coach Business . . .*

Let bright lights bring it

BRIGHT, well-placed interior lights furnish *reading comfort* that attracts fares . . . good motor coach business. And steady driving lights assure safety.

Successful operators make sure of this. They equip their coaches with a capable power plant . . . a generator of the right capacity, backed by a *dependable storage battery.* Their lights never dim. The trip seems shorter . . . the service more friendly. Passengers seek their coaches.

And look at the battery such motor coaches use. Chances are you'll find that it's an Exide Motor Coach Battery expressly planned for this heavy service. The engineers who designed it have a thorough knowledge of motor coach battery needs and forty-one years of battery building experience behind them.

The Exide Motor Coach Battery combines these essential qualities: (1) stamina for long running hours, (2) power for peak lamp loads, (3) sturdiness for constant service, (4) scientific construction that results in lowest operating cost per mile.

Write for information about this battery.

Exide
MOTOR COACH
BATTERY

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

In 1924 we paid nine cents for car journal oil; today we are paying thirty-four cents. What's the answer?

"ONE answer, chief, is lower power costs — a saving that has run as high as 7% per car. Another answer is a tremendous saving in waste and lower maintenance costs. Furthermore, we have been able to speed up service without any increase in operating cost per mile."

This is an authentic example of the results accomplished by one large electric railway system with Standard Car Journal Oils. It typifies the results that many electric railway companies have obtained through the use of Standard Railway lubricants and Standard Oil Company (Indiana) lubrication service.

Standard Car Journal Oils, Standard Gear Grease, Standard Curve Grease and Standard Compressor Oils properly selected and correctly applied insure lubrication that is efficient — that will effect economies well worth consideration.

It places you under no obligation to us for you to have one of our engineers study your lubrication requirements.

STANDARD OIL COMPANY (*Indiana*)

General Offices: 910 South Michigan Ave. Chicago, Illinois

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Chicago
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30 Years Braking Service to Railways
AMERICAN BRAKEBLOKS TRADE MARK REG. U.S. PAT. OFFICE
Now Serving the Automotive Field

American Brakebloks

In Service After 52,000 Miles-

Best other material-15,000 miles

Over Mountain Roads

Report of an operator of heavy jobs over western mountain roads is an eloquent recommendation of American Brakebloks.

The round trip is 220 miles — the grade averages 8% — 100 miles of the 220 is severe mountain road.

He has been unable to obtain more than 15,000 miles with other type linings. American Brakebloks have gone 52,000 miles and are still rendering perfect service.

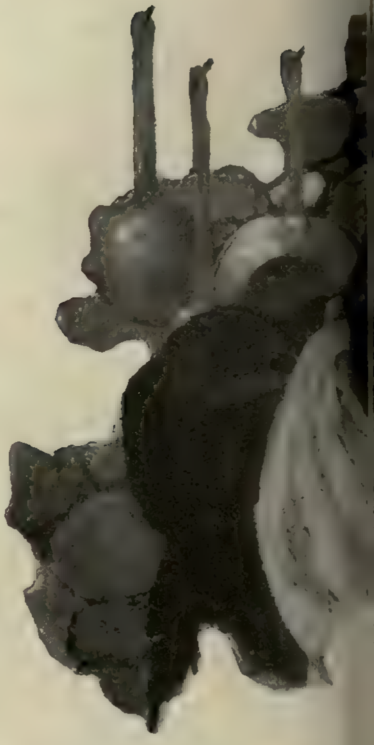
American Brakebloks are the latest achievement of a group of braking experts, acknowledged leaders for 30 years. Thousands of experiments produced it — thousands of tests on every type of bus and road have proved it the brake material ideal.

You can obtain it on new equipment by specifying it. On your present equipment it can be applied as easily as ordinary lining.

Your nearest N.A.P.A. distributor will supply your replacement needs.

American Brake Materials Corporation
Subsidiary of
The American Brake Shoe and Foundry Company
Main Office and Factory
Detroit, Michigan

Sales Offices: New York City; Chicago, Illinois; San Francisco, Calif.



Just a teapot
to his aunt
—but a BIG IDEA
to James Watt

FOR over an hour a frail, visionary youth sat engrossed with a steaming teapot. "Aren't you ashamed to waste your time so!" scolded his aunt. She saw a teapot—nothing more; Watt saw a teapot, and something else—*steam in industry.* And the world's industrial development made little headway until James Watt saw with the eyes of the pioneer.

❖ ❖ ❖

Today's business leaders are pioneers on a gigantic scale . . . pioneering with new conditions, new factors . . . pioneering with the vision of James Watt. Result: constant new developments in the realm of power. . . in silk, leather and paint . . . new methods . . . new machines . . . new legislation . . . new generations with emphatic new ideas . . . all business being affected by new, outside influences.

How will your business problems be altered by changes now in the making—by developments outside your immediate realm? No longer is it sufficient merely to keep posted on current events. You must realize their future significance . . . *to your business.* You must see forward with the eyes of the pioneer.

❖ ❖ ❖

The Magazine of Business helps you to do just that. This McGraw-Hill publication for the chief executive is primarily a magazine of interpretation. With the viewpoint of the broad range of business activity, it detects developments at their origin and

McGRAW-HILL

McGRAW-HILL PUBLISHING COMPANY, Inc., New York - Chicago

projects them forward. It views Today's developments as they will control Tomorrow's new conditions. It searches for the relation of the remote trend to all business affected.

The Magazine of Business is peculiarly equipped for this task. Other McGraw-Hill publications, each in its prescribed field, penetrate basic industries . . . tap the original sources of new developments.

All these contacts, McGraw-Hill's staff of 128 specialist editors, its records, news-gathering facilities, resources for research and for marketing counsel—the resources of the entire organization aid *The Magazine of Business* to achieve its purpose.

THE MAGAZINE OF BUSINESS

is one of 24 McGraw-Hill publications, all actuated by the same spirit of interpretative purpose. 600,000 industrialists, engineers and business men subscribe regularly to these publications. More than 3,000,000 use McGraw-Hill books and magazines in their business.

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Cut "*Out of Service*" time on Bus Painting

LARGE bus operating companies can reduce the "Out of Service" time necessary for repainting buses, and increase the annual revenue days per bus by installing spray painting equipment in their paint shops. The number of reserve buses may also be reduced due to the reduction in time required for painting and the rapid drying qualities of Duco or similar finishes. Mahon engineers, backed by experience covering a large percentage of all Spray Booth installations throughout the United States and Canada, will gladly give you complete data on this subject. Consultation with these Spray Booth experts will not place you under obligation.

Arrange for a consultation today.

THE R.C.MAHON COMPANY
DETROIT, MICHIGAN
Manufacturers of Spray Booths and Exhaust Stacks, Industrial Drying Ovens and Blow Pipe Systems

MAHON
SPRAY BOOTHS & EXHAUST STACKS
• DESIGNED FOR FIRE SAFETY •

Electrical Efficiency and Mechanical Strength Mean

Better Bonds and Bonding

Erico type E A S Bond is brazed to the rail. The large area of terminal contact assures the electrical efficiency of the bonded joint.

Permanent carrying capacity of the bond is guaranteed by the great mechanical strength of the brazed union. That means better bonds and bonding!

Type E A S may be applied to virtually any rail joint—the loop of the bond can be offset at any angle. Bonds are furnished with either flexible concentric stranded or extra flexible rope lay cable. Due to the stranded cable construction rail vibrations are damped—wires do not crystallize and break.

Electric Railways test, order, and then reorder. That's proof for our contention of better bonds and bonding.

Send for a sample of a type E A S Bond. Address—

The Electric Railway Improvement Co.
2070 E. 61st Place, Cleveland, Ohio

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RAIL BONDS AND BONDING OUTFITS

A Great **NAME** *in* **INDUSTRY**

JOHNSON Bronze Service to Industry starts with intelligent counsel on bronze bearing problems — without obligation to the manufacturer.

It provides for the specialized manufacture, to specifications from virgin metals, of all types of bronze parts for bearing purposes.

It carries on to the point of maintaining conveniently located stocks of finished product for individual customers, and finally delivers this product ready for use at fair prices.

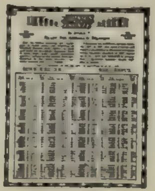
In regular production are Bronze Back Babbitt Lined Bearings, Cast Bushings and Parts, Rolled Sheet Metal Bushings, Car and Engine Castings, Cored and Solid Bar Bronze.

Manufacturers of vehicles and machinery interested in complete service of this kind should write Johnson Bronze Company, New Castle, Pa., or branches at Chicago, New York, Detroit, Cleveland, Kansas City and San Francisco.

BY STRICT adherence to the policy, "If a thing is worth doing, it is worth doing well," Johnson Bronze has earned an enviable reputation thruout the length and breadth of industry.

Charting Johnson Bronze progress up thru the past quarter century, it is unmistakably clear that this great name has been made by the consistent delivery of a quality product at fair prices when and exactly as wanted.

Today, Johnson Bronze is regarded everywhere as a specialist in the art of bronze bushing and bearing manufacture, and is thus being privileged to serve an increasingly large number of vehicle and machinery builders and users.



Write for a copy of this handy Wall Card which lists over 600 "in stock" sizes ready for immediate delivery.

JOHNSON BRONZE

BUSHINGS **BEARINGS** **BAR BRONZE**

Anaconda Composite Cable

selected by ~ ~ ~

PAULISTA RAILWAY FOR MAIN MESSENGER

ANACONDA high strength composite cable was selected for the main messenger in the electrification program of the Paulista Railway, San Paulo, Brazil. The specifications for this cable, made to Anaconda design No. 154, are as follows:—

Conductance Equivalent H. D. Copper at 20 degrees C	500,000 c. m.
Outside Diameter of Cable	.878 inches
Diameter of Individual Wires	.1254 inches
Area of Complete Cable	.4570 sq. inches
Breaking Strength of Cable (Minimum)	31,000 lbs.

This cable was made of Anaconda Copper and Copper Alloy Wire throughout and therefore is immune to failure by corrosion. The coefficients of expansion of the wires are alike; consequently loading stresses under varying temperatures are always properly distributed between copper and high strength wires.

This installation demonstrates the ability of Anaconda engineers to design and construct special cables to meet exacting requirements. If you have electrification problems we invite you to consult our Engineering Department.

THE high conductivity and uniform quality of Anaconda Metals are the result of the co-ordinated supervision by a single organization of every process from ore to finished product. Six wire mills offer a coast-to-coast service unequalled for promptness and dependability.

ANACONDA COPPER MINING CO.
THE AMERICAN BRASS COMPANY
Rod, Wire and Cable Products
General Offices: 25 Broadway, New York
Chicago Office: 111 West Washington Street

ANACONDA WIRE PRODUCTS

ANOTHER APPLICATION OF **SKF** BEARINGS
ON THE
Street Railways of America

YOU MAY BUY A
BEARING AS A
BARGAIN BUT
TRY AND GET A
BARGAIN OUT OF
USING IT
for
Nothing is apt to cost so much
as a bearing that cost so little.

SKF
Puts the
Right Bearing
in the
Right Place

If Your Car Equipment can be Modernized
Give it a chance to earn money—Use **SKF**

WHERE existing car equipment has possibilities of being modernized to meet the new era in street transportation, SKF Self-Aligning Roller Bearing Journals should certainly be considered as an essential part of such a program. By changing over from plain bearings to SKF, much of the advantages possible in a new design of truck are thus obtained.

SKF Self-Aligning Roller Bearings are rugged, dependable units, which do not require constant inspection and maintenance to keep them on the road. They never require any adjustments initially or while in service. Smooth operation, freedom from hot boxes and pleased passengers make SKF an investment which actually pays for itself in a very short time.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2230

SKF

Ball and Roller Bearings

A signal that flashes on and off two months at a time without attention

THE NEW

VEREADY PORTABLE FLASHER

AN power is saved. The new Ever-ady Portable Flasher operates for two onths or longer without attention. our sturdy Eveready Dry Batteries upply it with certain, sure, ever-ependable light. An extra lamp inside he battery housing provides for mergencies.

The strongest winds, the fiercest rain annot blow out, or drown out the arning light in the Eveready Portable lasher. It is absolutely impervious to eather conditions.

The intermittent flash of the warning ight draws immediate attention to the anger. The four sturdy Eveready Dry atteries operating this remarkable asher are designed to take advantage f the intermittent action. They last nger because they recuperate in the hort periods between flashes. The new veready Portable Flasher is sold hrough National Carbon Company's istributors.

ATIONAL CARBON CO., INC.
New York, N. Y.

Branches
Atlanta Chicago Kansas City
Long Island City San Francisco

UCC
Unit of Union Carbide and Carbon Corporation

EVEREADY
TRADE MARK
PORTABLE FLASHER
— dry battery operated

Specifications—Height 16 inches. Diameter of base 7 inches. Weight, including batteries, 16½ pounds. Requires four standard Eveready 6-inch Dry Cells connected in series to deliver 6 volts. Extra 6-volt lamp inside battery housing. Battery compartment constructed of seamless steel attractively finished in red. Top of flasher cadmium plated for weather protection. Heavy fresnel-type red glass lens. Padlock for battery compartment with an extra-long hasp so that the device can be chained. This flasher is of rugged construction throughout and entirely weather-proof.

& COMPANY
CARS STOP HERE
NO PARKING
SA
ELECTRIC RAILWAY SERVICE AND COLLIER SERVICE BRING THE BUYERS TO MARKET

Car Card Advertising Almost Everywhere!

BARRON G. COLLIER INC.

NEW YORK CITY

THE DAYTON INTEGRAL SYSTEM OF TRACK AND PAVING STRUCTURE IS IN YOUR BUDGET NOW

The Dayton Integral System of Track and Paving Structure Gives You Lasting Track

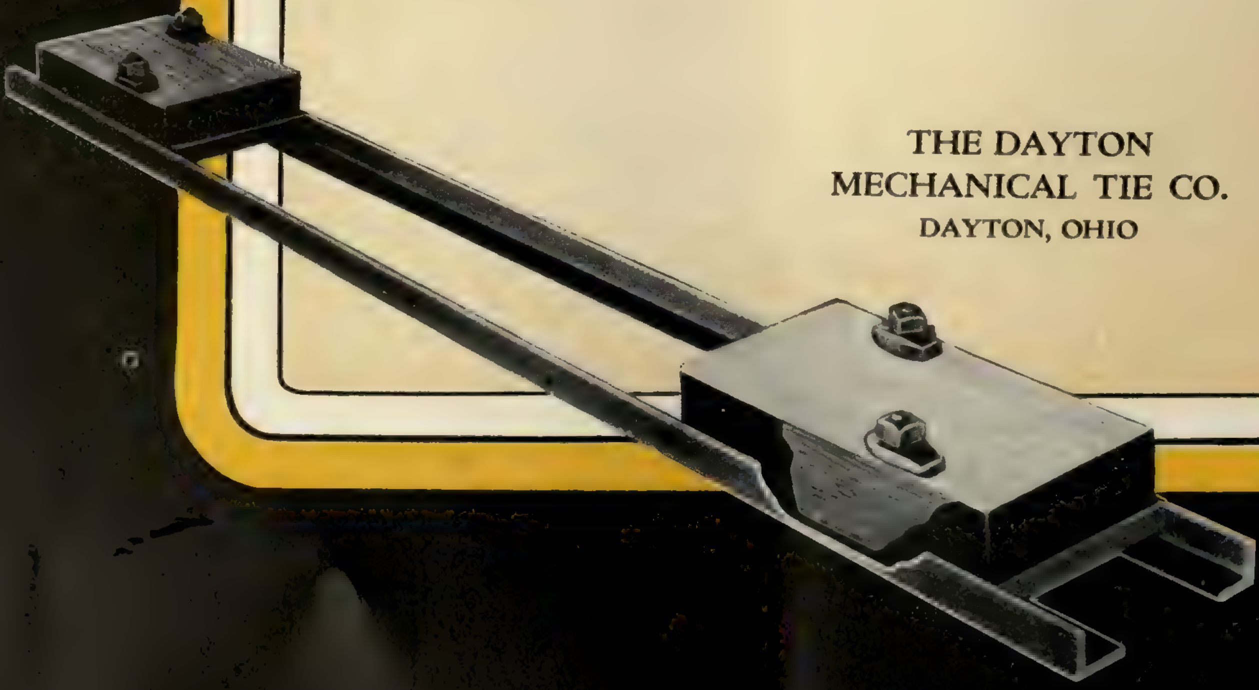
Your Budget Includes The Dayton Integral System of Track and Paving Structure

Engineers who have used the Dayton Integral System of Track and Paving Structure say that it is never more expensive than any other good track construction—often less expensive.

Why not, therefore, have this lasting Track at the same cost as shorter life track. Properties all over the country have solved their track problem in this way.

One base for track and paving—no trouble or maintenance on either for years—track and paving structure unified into a single durable whole—this is the Dayton Integral System of Track and Paving Structure.

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO



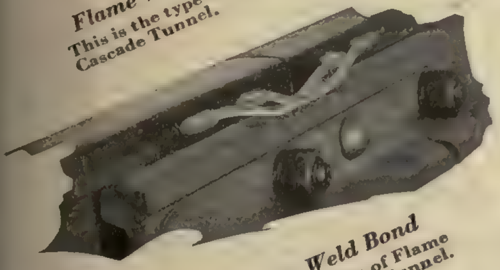
CONGRATULATIONS

The American Steel and Wire Company wishes to tender a deserved tribute to the Great Northern Railroad and A. Guthrie and Company, contractors, on the successful completion of the Cascade Tunnel.

It was a tremendous project nobly conceived and ably executed, truly an epoch making achievement.

This Company naturally takes pride in the fact that its Flame Weld Bonds were used in the electrification of the tunnel, thus playing some part in this great forward step in transportation.

Flame Weld Signal Bond Type F-2
This is the type of Signal Bond used in the Cascade Tunnel.



Application of Flame Weld Bond
This shows the double application of Flame Weld Bonds used in the Cascade Tunnel.

American Steel & Wire Company

Subsidiary of United States Steel Corporation
208 So. LaSalle St., Chicago 30 Church St., New York
Offices in—Boston, Cleveland, Worcester, Philadelphia, Pittsburgh, Buffalo, Detroit, Cincinnati, Baltimore, Wilkes-Barre, St. Louis, Kansas City, Minneapolis-St. Paul, Oklahoma City, Birmingham, Atlanta, Memphis, Dallas, Denver, Salt Lake City.
U. S. Steel Products Co.: San Francisco, Los Angeles, Portland, Seattle.
Export Representative: 30 Church St., New York City

...leadership that goes far beyond mere marketing

IT CAN truthfully be said that The DeVilbiss Company expends a far greater effort in originating, developing, and perfecting spray-painting and spray-finishing systems than it does in merchandising them.

This organization has never ceased to consider that its product is one of the tools used in the craft, business, or industrial operation of the user, and it consistently adheres to the policy that its first obligation is to assure satisfactory results from the use of a DeVilbiss system or any part of it.

A fast-increasing number of DeVilbiss spray systems are being used in finish maintenance by electric railway transportation companies, both for cars and auxiliary bus units. And DeVilbiss systems are bought by these users rather than sold to them, because the resulting definite economies of money, time, and trouble are eagerly sought by the up-to-date electric railway operator.

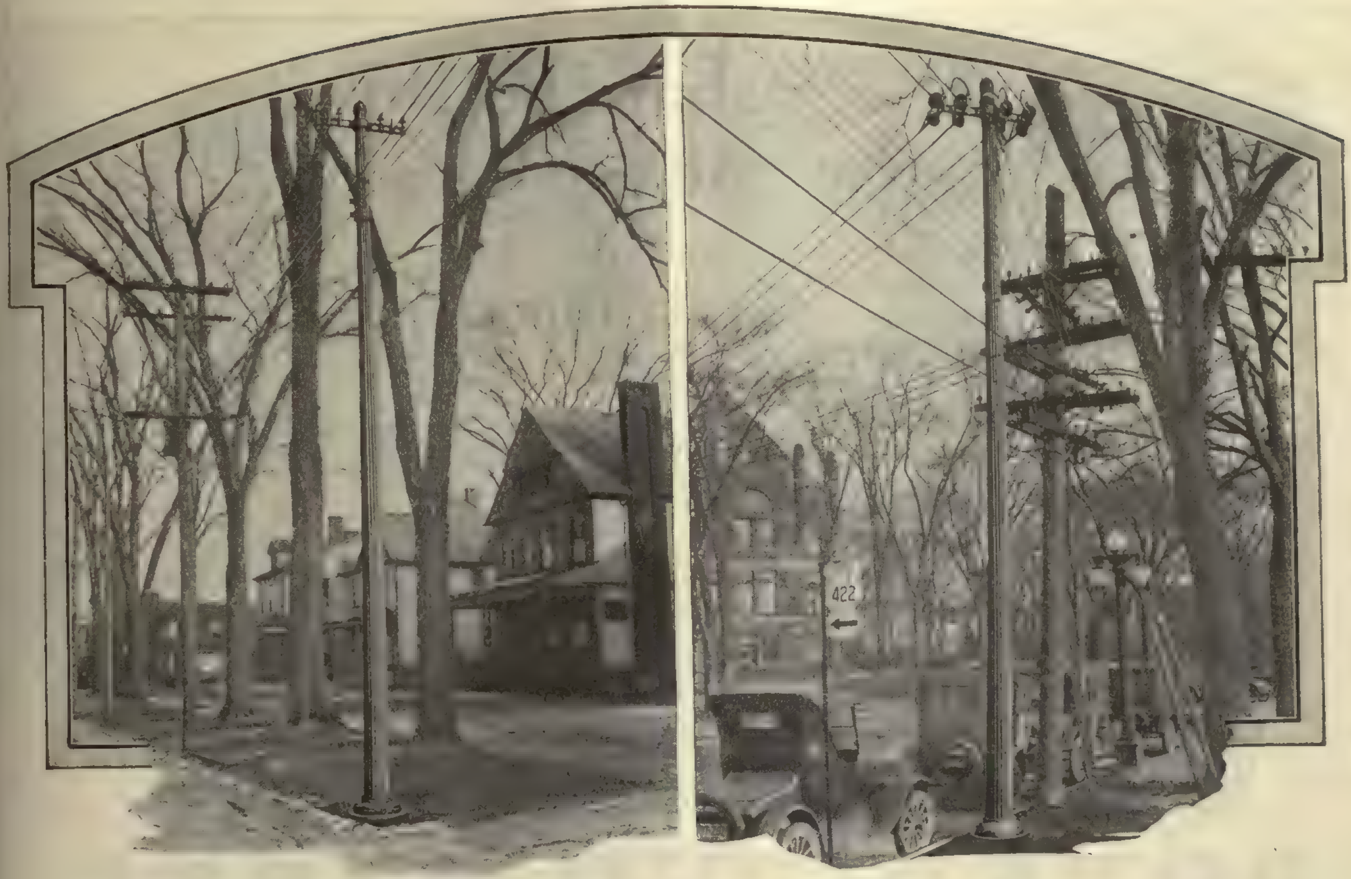
We will gladly tell you all about specialized DeVilbiss spray systems for electric railway finish maintenance.

DeVilbiss
Spray-PAINTING FINISHING System

Spray guns of various types and sizes
Pressure feed paint tanks and containers
Spray booths, exhaust fans, and approved lighting fixtures
Air compressing equipment
Air transformers and accessories
Air and fluid hose and connections
Complete outfits from the smallest hand-operated units to the largest industrial installations.

THE DEVILBISS COMPANY , 272 PHILLIPS AVENUE , TOLEDO, OHIO

Sales and Service Branches
NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO ST. LOUIS
SAN FRANCISCO WINDSOR, ONT.
Direct factory representatives in all other territories



Permanent Poles Provide Better Distribution Service

A PERMANENT institution naturally demands permanent materials for its equipment. Consequently, when the Ohio Public Service Company decided to rebuild their distribution system in the downtown district of Warren, Ohio, they selected Union Metal Poles to replace the old type. The above photographs show the work in progress.

All services now carried on several sets of poles will be combined on the new Fluted Steel Distribution poles. The reduction in the number of poles will do much to improve street appearance. The credit for this improvement, of course, accrues to the benefit of the utility.

Utility companies in dozens of cities are revamping their distribution service through the use of attractive Union Metal Poles. The long life of this type of pole protects the original investment.

Union Metal engineers are ready to help you with your particular problems and show you how this modern equipment can benefit your company.

THE UNION METAL MANUFACTURING CO.
General Offices and Factory, Canton, Ohio
Branches—New York, Chicago, Philadelphia, Cleveland,
Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta.
Distributors:
Graybar Electric Company, Incorporated G-E Merchandise Distributors Association
Offices in all principal cities

UNION METAL
DISTRIBUTION AND TRANSMISSION POLES

They're hard boiled every one of them!

Boyerized Parts have to be hard boiled to stand the wear and tear.

Yet with all, they have a heart of gold. For they save the shop much trouble and expense by not shouting for replacement, and they give added safety, too.

It's the special Boyerizing treatment that makes them hard as nails, and it's their superior design and materials that contribute to their kindly nature.

Most railway men know this. That's why they specify and insist on them.

BEMIS CAR TRUCK COMPANY
ELECTRIC RAILWAY SUPPLIES
SPRINGFIELD, MASS.

Representatives:
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Ore.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 519 Delta Building, Los Angeles, Cal.

- **Brake Pins**
- **Brake Hangers**
- **Brake Levers**
- **Pedestal Gibs**
- **Brake Fulcrums**
- **Center Bearings**
- **Side Bearings**
- **Spring Post Bushings**
- **Brake Bushings**
- **Bronze Bearings**
- **Bolster and Transom Chafing Plates**
- **Spring Posts**
- **McArthur Turnbuckles**
- **Manganese Brake Heads**
- **Manganese Truck Parts**

BOYERIZED PARTS

A STANDARDIZED LUBRICANT

TULC
A
LUBRICANT

TULC is used by many Electric Railway properties as standard lubricant

TULC will eliminate many lubricating problems

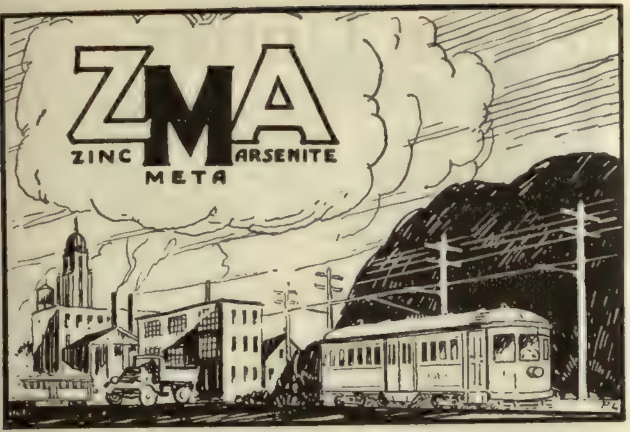
TULC will prolong the life of bearings

TULC will show a reduction in power consumption

TULC is made especially for the lubrication of rolling stock.

THE UNIVERSAL LUBRICATING CO.

1400 Schofield Bldg., Cleveland, Ohio



POLES

Signal — Power — Telegraph — Telephone

ZMA poles are the most modern. They are permanently preserved. Termites and other insects will not attack them.

ZMA Poles are clean and may be painted. They meet with approval by municipalities which require poles to be attractive in appearance.

DISTRIBUTED BY

Canada Creosoting Company, Ltd.
Montreal, Canada

Eppinger & Russell Co.
New York City, N. Y.

Gulf States Creosoting Co.
Hattiesburg, Miss.

Joyce-Watkins Co.
Chicago, Ill.

New England Wood Preserving Co.
Boston, Mass.

Norfolk Creosoting Co.
Norfolk, Va.

Pendleton-Gilkey Co.
Minneapolis, Minn.

Piedmont Wood Preserving Co.
Augusta, Ga.

CURTIN-HOWE CORPORATION
Timber Preservation Engineers
11 PARK PLACE
New York City

Crozer B'dg.
Philadelphia, Pa.

New Orleans Bank Bldg.
New Orleans, La.

CURTIN - HOWE CORPORATION, Ltd.
McGill Building, Montreal, Canada

Sullivan Spader Wins in "blindfold test"

Hoag and Rollins were tunneling under the Maumee River at Toledo. They knew air clay diggers could beat hand labor. They didn't know which diggers were speediest.

So they tried a "blindfold test." Four men in the heading got four different clay spades. Clay spattered over the names. The men exchanged tools. When the shift came out of the hole—the superintendent asked which spade they wanted.

All voted for the same tool. The superintendent scraped off the clay and recorded the name, "SULLIVAN." After one week of testing, the contractors standardized on Sullivan Spaders.

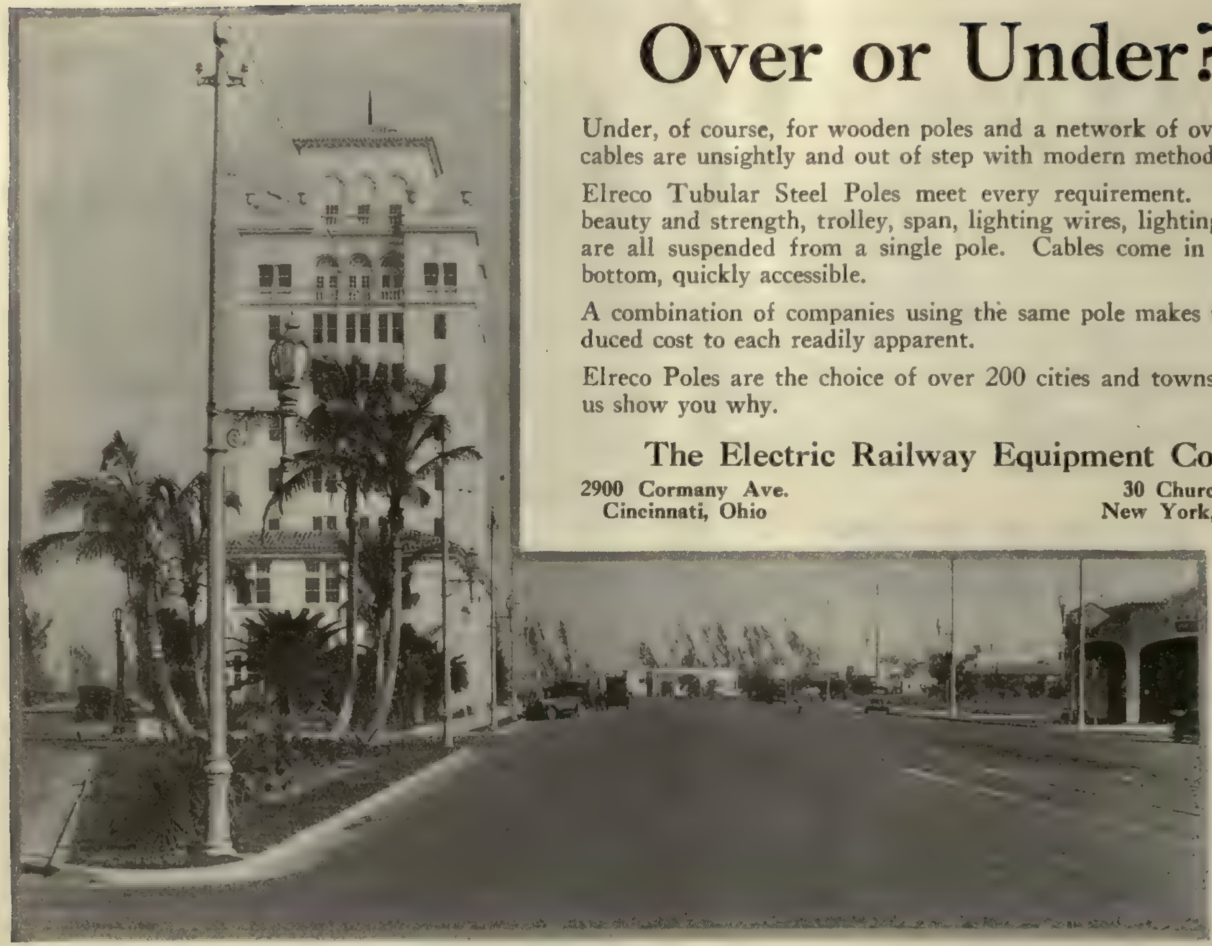
Sullivan Spaders are hard on clay, but easy on men. They are balanced, smooth-running, and powerful. Your men will like them, too.

Send for Catalog 3281-N.

The "DH-361" Spader is part of the complete new Sullivan Line of Drills. New Sullivan Hammer Drills, Drifters, Sinkers, and Concrete Breakers are making records, too. *Send for the Catalogs.*

SULLIVAN
MACHINERY COMPANY
150 S. Michigan Ave.
CHICAGO

SULLIVAN



Over or Under?

Under, of course, for wooden poles and a network of overhead cables are unsightly and out of step with modern methods.

Elreco Tubular Steel Poles meet every requirement. Great beauty and strength, trolley, span, lighting wires, lighting units are all suspended from a single pole. Cables come in at the bottom, quickly accessible.

A combination of companies using the same pole makes the reduced cost to each readily apparent.

Elreco Poles are the choice of over 200 cities and towns. Let us show you why.

The Electric Railway Equipment Co.

2900 Cormany Ave.
Cincinnati, Ohio

30 Church St.
New York, N. Y.

SHULER

FRONT AXLES

A complete line for Trucks, Tractors and Trailers.

for Motor Busses

SHULER AXLE COMPANY

Louisville Incorporated Kentucky

Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000 Wet 31,400. Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company

Muncie, Ind.

Est. 1848—Inc. 1870

LORAIN

Girder Rails, Special Trackwork, Switches, Frogs and Crossings in Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail

The Lorain Steel Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

General Offices: Johnstown, Pennsylvania

Sales Offices:

Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

Pacific Coast Distributors: United States Steel Products Co., San Francisco, Seattle, Portland, Los Angeles

Export Distributors: United States Steel Products Co., New York

Provide for *Safe Acceleration of Traffic*

Automatic signals, Interlocking installations and Power operated remotely controlled switches are being used economically for safe acceleration of traffic, by providing proper spacing of cars, and eliminating unnecessary stops.

Highway Crossing Protective devices are a dependable insurance which soon pay off the investment.

Our specialists at your service without obligation.

TRADE US MARK **Union Switch & Signal Co.** TRADE US MARK

SWISSVALE, PA.

Bankers and Engineers

Ford, Bacon & Davis
Incorporated
Engineers
39 Broadway, New York
PHILADELPHIA CHICAGO SAN FRANCISCO

STONE & WEBSTER
Incorporated
Design and Construction
Examinations Reports Appraisals
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Examinations Reports Valuations
CHICAGO NEW YORK SAN FRANCISCO

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS
REPORTS - APPRAISALS - RATES - OPERATION - SERVICE

STEVENS & WOOD
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KELKER, DELEUW & CO.
CONSULTING ENGINEERS
REPORTS ON
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BUCHANAN & LAYNG CORPORATION
Engineering and Management, Construction
Financial Reports, Traffic Surveys
and Equipment Maintenance
BALTIMORE
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Phone: Hanover: 2142
NEW YORK
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E. H. FAILE & CO.
Designers of
Garages— Service Buildings— Terminals
441 LEXINGTON AVE. NEW YORK

The J. G. White Engineering Corporation
Engineers — Constructors
Steam and Hydro-Electric Power Plants, Gas Plants,
Steam and Electric Railroads, Transmission Systems,
Buildings and Industrial Plants.
43 Exchange Place New York

THE BEELER ORGANIZATION
Transportation, Traffic, Operating Surveys
Better Service—Financial Reports
Appraisals—Management
52 Vanderbilt Ave. New York

ENGELHARDT W. HOLST
Consulting Engineers
Appraisals Reports Rates Service Investigation
Studies on Financial and Physical Rehabilitation
Reorganization Operation Management
683 Atlantic Ave., BOSTON, MASS.

WALTER JACKSON
Consultant on Fares and Motor Buses
The Weekly and Sunday Pass—Differential
Fares—Ride Selling
Holbrook Hall 5-W-3
472 Gramatan Ave., Mt. Vernon, N. Y.

BYLLESBY
ENGINEERING AND MANAGEMENT CORPORATION
231 S. La Salle Street, Chicago
New York Pittsburgh San Francisco

McCLELLAN & JUNKERSFELD
Incorporated
ENGINEERING AND CONSTRUCTION
Examinations—Reports—Valuations
Transportation Problems—Power Developments
68 TRINITY PLACE NEW YORK

HEMPHILL & WELLS
CONSULTING ENGINEERS
Gardner F. Wells Albert W. Hemphill
APPRAISALS
INVESTIGATIONS COVERING
Reorganization Management Operation Construction
50 East 42nd St., New York City

THE P. EDWARD WISH SERVICE
50 Church St., NEW YORK
Street Railway Inspection
DETECTIVES
131 State St., BOSTON

When writing the advertiser for information or prices, a mention of the Electric Railway Journal would be appreciated.

The Ideal Insulation for Electric Railways

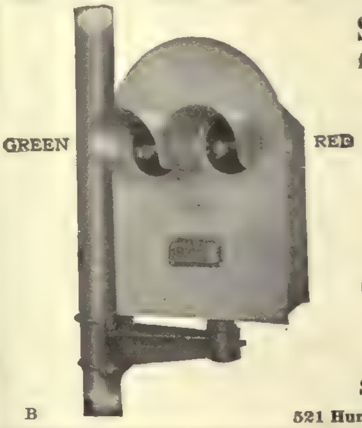
INSULATED WIRES and CABLES
OKONITE, MANSON and DUNDEE TAPES

POWER CABLES, SIGNAL CABLES
and CAR WIRING

THE OKONITE COMPANY

THE OKONITE-CALLENDER CABLE CO., INC.,
Factories: Passaic, N. J. Paterson, N. J.
Sales Offices: New York, Chicago, Pittsburgh, St. Louis, Boston, Atlanta, Birmingham, San Francisco, Los Angeles, Seattle, Dallas.

Okonite Quality Standards Unchanged for Half a Century



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for our Publication on
SAFETY
and
EFFICIENCY
in Electric Railway
Signals and
Crossing Bells

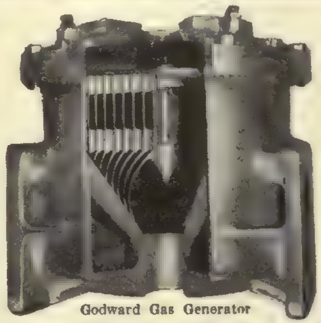
EST. 1885 AIMCo INC. 1915
"American"
INSULATING
MACHINERY
COMPANY
REG. U.S. PAT. OFF.
521 Huntingdon St., Philadelphia, Pa.

Double Register
Type R-11

International
Registers

Made in single and double types to meet requirements of service. For hand or foot, mechanical or electric operation. Counters, car fittings, conductors' punches.

The International Register Co.
15 South Throop Street, Chicago, Illinois



Godward Gas Generator

You can
now use
Fuel Oil
in buses with
the Godward Gas
Generator

National Railway Appliance Co.
420 Lexington Ave., New York
BRANCH OFFICES
Munsey Bldg., Washington, D. C. 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Building, Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Calif.
Lister-Reese, Inc., 401 S. Brand Blvd., Glendale, Calif.

Elevated—Subway—Surface Lines
Special Trackwork
of
TISCO MANGANESE STEEL

WM. WHARTON JR. & CO., INC.
EASTON, PENNA.

SALES OFFICES
Boston Chicago El Paso Fort Worth Knoxville Montreal
New York Scranton Philadelphia Pittsburgh San Francisco

The DIFFERENTIAL CAR

Standard on
60 Railways for

Track Maintenance
Track Construction
Ash Disposal
Coal Hauling
Concrete Materials
Waste Handling
Excavated Materials
Hauling Cross Ties
Snow Disposal

Use These Labor Savers

Differential Crane Car
Clark Concrete Breaker
Differential 3-way Auto Truck Body
Differential Car Wheel Truck and Tractor

THE DIFFERENTIAL STEEL CAR CO., Findlay, O.

Bethlehem Products for
Electric Railways

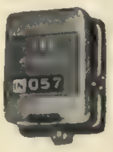
Tee and Girder Rails; Machine Fitted Joints; Splice Bars; Hard Center Frogs; Hard Center Mates; Rolled Alloy Steel Crossings; Abbott and Center Rib Base Plates; Rolled Steel Wheels and Forged Axles; Tie Rods; Bolts; Tie Plates and Pole Line Material.

Catalog Sent on Request

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

BETHLEHEM

Johnson
Electric
Fare
Boxes



and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Over 5000 already in use.

Johnson Fare Box Co.
4619 Ravenswood Ave., Chicago, Ill.

COLUMBIA

Railway and Utility Supplies

Castings—Grey Iron,
Brass and Aluminum

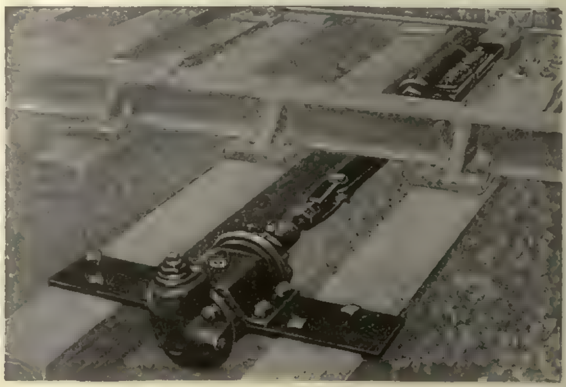
Forgings
Special Machinery
and Patterns

Machine and Sheet
Metal Work

Armature and
Field Coils.

The Columbia Machine Works *and M. I. Co.*
265 Chestnut St., corner Atlantic Ave.,
Brooklyn, New York

RACOR
TRADE MARK



QUICK TO OPEN—SLOW TO CLOSE
Oil Cylinder Retarding Dash Pot

This device acts on the principle of a door check or gun recoil mechanism. Used where switches are normally trailed through, it eases the return of the points and thus saves wear on the inside of the points. The action is definite and it will work under all climatic conditions.

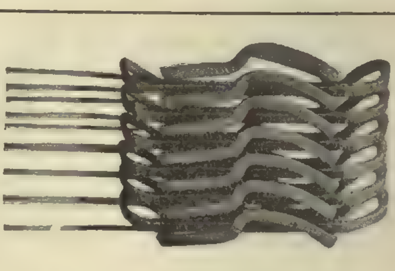
RAMAPO AJAX CORPORATION

Main Office–HILLBURN, NEW YORK
SALES OFFICES AT WORKS, ALSO
30 CHURCH STREET, NEW YORK
McCORMICK BUILDING, CHICAGO

RACOR PACIFIC FROG & SWITCH CO.
Los Angeles—Seattle

CANADIAN RAMAPO IRON WORKS, LTD.
Niagara Falls, Ontario

Eight Works—
Hillburn, N.Y. Niagara Falls, N.Y. Chicago, Illinois, East St. Louis, Ill.
Pueblo, Colorado, Superior, Wis. Los Angeles, Cal. Niagara Falls, Ont.



You Get the
Added Wear

Because Elliott-Thompson Coils are built to fit, they slip into grooves without abuse. You get full efficiency from the start, added wear.

They are fine for maintenance work. Put a few in stock and try them for your next replacement.

THE ELLIOTT-THOMPSON
ELECTRIC COMPANY
AJAX BLDG., CLEVELAND, OHIO

Quality

Back of recognized quality in design and construction of Anderson Time Switches, there are over twenty years of experience.

Skilled workmen make the parts and build the entire Time Switch in our own factory—and quality is proved by performance.

Send for Bulletin No. 37

Albert and J. M. Anderson Mfg. Co.
289-305 A St., Boston, Mass.
NEW YORK CHICAGO PHILADELPHIA LONDON

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches	$4.50 an inch
4 to 7 inches	4.30 an inch
8 to 14 inches	4.10 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

R.J.

POSITIONS WANTED

EXECUTIVE engineer. I am in the best years of my life. Have had 20 years' experience with a large Eastern property as cadet engineer, track foreman, roadmaster, superintendent M. of N., and division manager. Now employed, but desire to make a change for personal reasons. PW-168, Electric Railway Journal, Tenth Ave. at 36th St., New York.

RESEARCH ENGINEER with technical training and background of railway experience, particularly fitting him to organize and co-ordinate your research and statistical activities, or head existing department. PW-166, Electric Railway Journal, Tenth Ave. at 36th St., New York.

SUPERINTENDENT transportation, qualified by wide experience, proven successful record, every phase of transportation. Successful in employe and public relations, increasing revenue, decreasing operating costs. Available short notice. Fine references. PW-167, Electric Railway Journal, Tenth Ave. at 36th St., New York.

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BRILL TRUCKS

4—Second hand Brill Trucks Model 79-E-1.

GARY RAILWAYS COMPANY
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OFFICIAL PROPOSAL

Bids: March 22.

Signal System

New York, N. Y.

Notice is hereby given that a public hearing will be held at the Office of the Board of Transportation of the City of New York, at No. 49 Lafayette Street, Borough of Manhattan, on the 22nd day of March, 1929, at 11:30 a.m., on the proposed terms and conditions of the draft form of contract for furnishing and installing signal and interlocking equipment on New York City's New Subway System, along Church Street, Sixth Avenue Extension, Central Park West, 8th Avenue, St. Nicholas Avenue, Broadway, Fort Washington Avenue and Broadway, and 207th Street, from Vesey Street to 207th Street, including the 207th Street Yard, at the Harlem River, in the Borough of Manhattan, City of New York.

Copies of said draft form of proposed contract may be obtained at the Office of the Board of Transportation, at One Dollar each.

JOHN H. DELANEY,
Chairman.

FRANCIS J. SINNOTT,
Secretary.

March 5, 1929.

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34—600 volts, 300 amp. Meters, 120 watthours per disk revolution.

28—600 volts, 100 amp. Meters, 40 watthours per disk revolution. Above meters in A-1 condition.

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8—Westinghouse 506 Motors complete and and in good running condition, less pinions and gear cases, in exchange for Westinghouse 508 Motors.

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1—20 hp. Motor, 925 r.p.m.
1—10 hp. Motor, 1,350 r.p.m.
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4—5 hp. Motor, 1,300 r.p.m.
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Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

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Westinghouse Air Brake Co

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Continued on page 64

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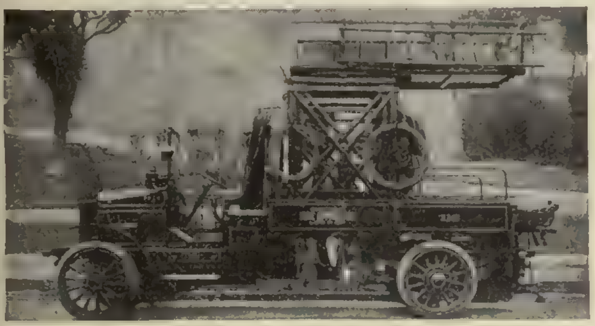

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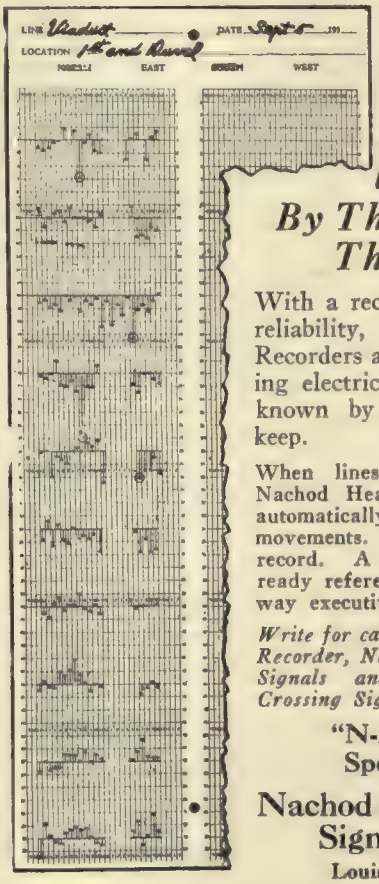

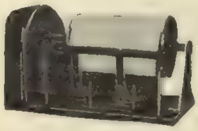

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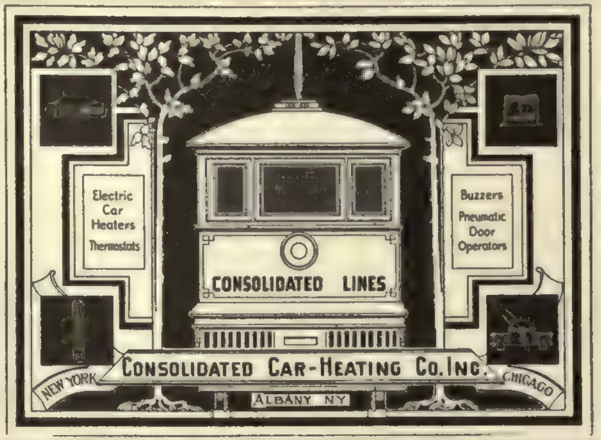

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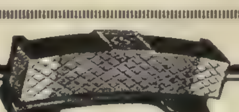

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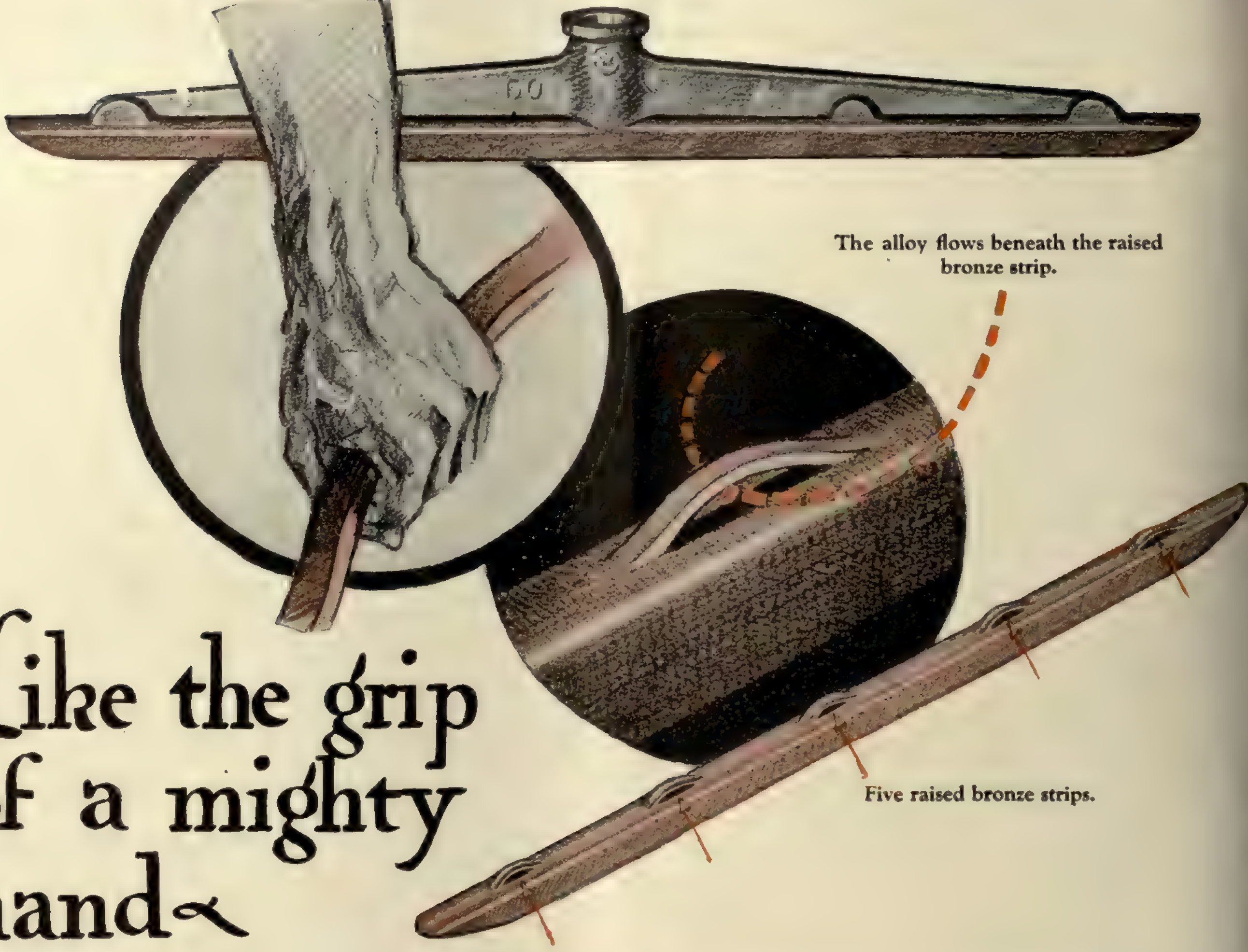
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Electric Railway Journal

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March 23, 1929

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AERA
1929

Advertising Index — Alphabetical, 34; Classified, 30, 32, 34; Searchlight, 28, 29

BETTER RAIL, BETTER TRANSPORTATION

Straphanger Psychology

"The straphanger in a dirty, crowded, old-fashioned street car is not particularly interested in the fact that the same company operates attractive de luxe bus service on some other route. What he wants is good service on his own route;"

and—

the backbone of good service is good track. No matter what else you do, you can give good service only on good track.

Bulletins on
these track
improvers?

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

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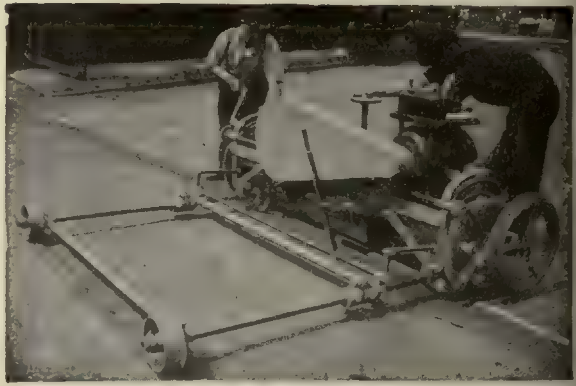
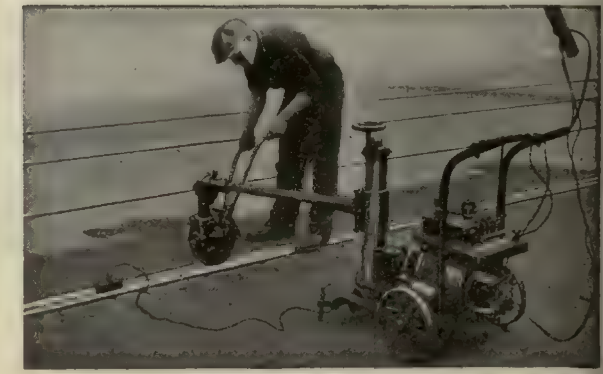
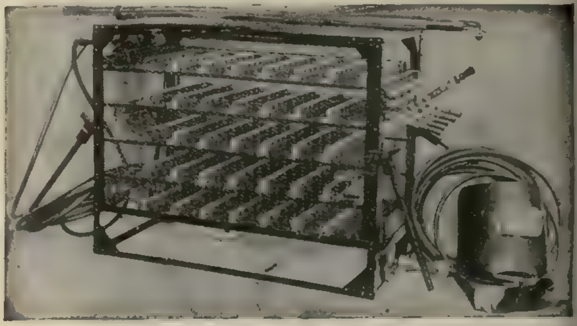


Vulcan Rail Grinder



Eureka Radial Rail Grinder

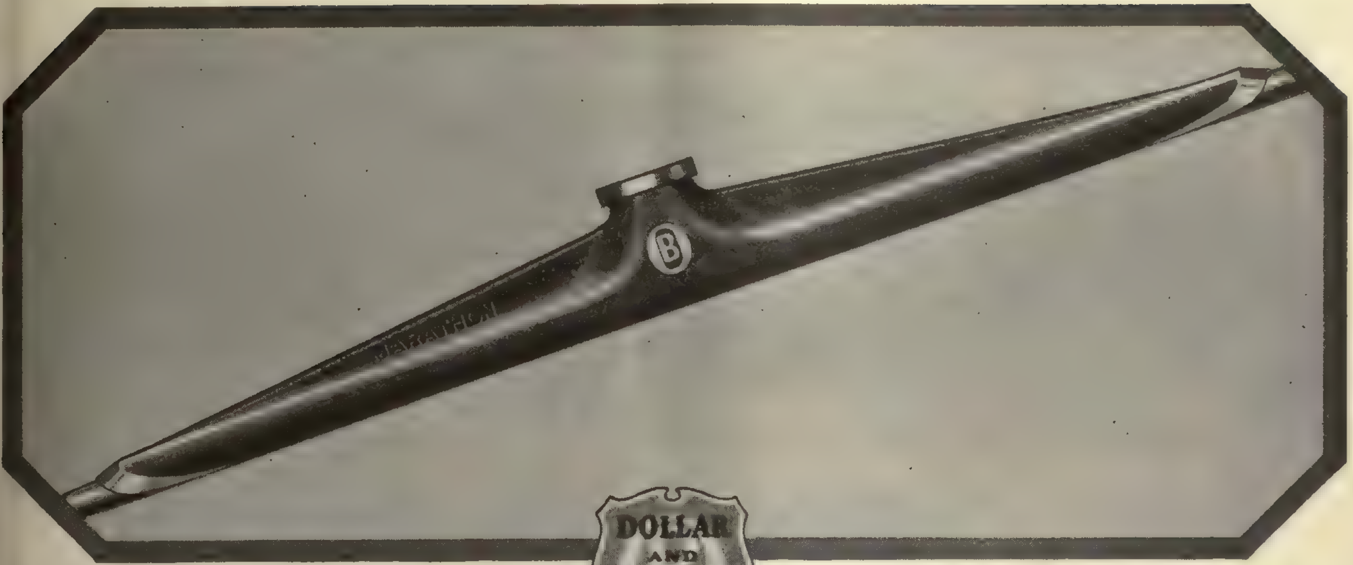
Reciprocating Track Grinder



"Ajax" Electric Arc Welder

BETTER RAIL, BETTER TRANSPORTATION

3177



DOLLAR AND SENSE INVESTMENTS

Back They Come for More of the Same . . . .

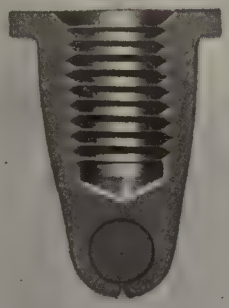
IT is easy to understand how any progressive overhead superintendent will give a product—such as the Marathon Ear—an opportunity to prove its claims in actual service. But there is more to it than experiment and test when the repeat orders of these same superintendents plus orders from new users during 1928 exceeded by 25% the total purchases of Marathon Ears in 1927. *There must be a reason.* There is. The reason is contained in the Marathon Ear advantages continuously pointed out.

Five Points of Service

These five points of service definitely indicate the characteristics that hold the friends of Marathon Ears year after year.

Easy Approach because lips are tapered to a knife edge at the tips and left heavy at the center. The wheel comes onto the ear gradually because of this special shaping at the tips.

Smooth Underrun by merging the special tip design and heavier section of the lips at the center. This provides a smooth passage for the wheel.



Sectional view of Marathon Ear at the boss showing the extra thickness of the metal lips, which adds thousands of car passes to the life of the ear.

Smooth wheel passage and ample metal in the lips *Protect the Trolley Wire* from wear or pounding.

Correct Proportioning has put plenty of bronze in the Marathon Ear just where it is needed most—yet none for excessive weight or overbalancing.

The combination of the four features outlined above with the scientifically controlled characteristics of O-B Bronze, puts the *Extra Life* in this Ear and in addition gives longer life to the trolley wire.

Replacements and Line Breaks Reduced

The reports of a test conducted by a large city property for 21 months show that ear replacements with Marathon Ears in service were reduced to 500 per month as compared to an experience of 1470 per month with other trolley ears. Line breaks were reduced from 73 to 30 the first year. This is not an unusual record for it has since been equalled or bettered in many cities.

300,000 Car Passes Per Ear

This same report showed that Marathon Ears lasted three times as long as others, and that even after over 300,000 car passes had not been worn out. These figures are offered as a basis of comparison with *all* other ears. Match them with your records—then investigate Marathon Ears at once.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1012L

Ohio Brass Co.
NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ATLANTA BOSTON SAN FRANCISCO CLEVELAND LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

One of the cars to which Simplex
Clasp Brakes have been applied

SIMPLEX MULTIPLE UNIT CLASP BRAKES

ASF

Railroads would not purchase passenger cars without "Simplex Clasp Brakes."

Why not specify "Simplex Multiple Unit Motor and Trailer Truck Clasp Brakes" for Gas — Electric and Electric Cars.

Send us your inquiries for information and designs.

The mechanically correct Brake for a Modern Car.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

FARADAY

means RELIABILITY

in Car Signal Systems

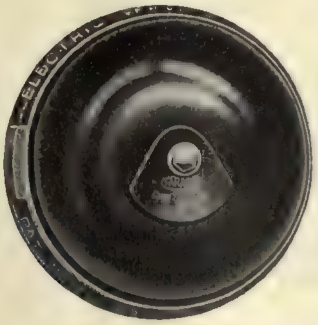
Type FB

Type CB

Type E

Type F

No. 22181 Resistance Panel



No. 21022 Single Stroke Bell

No. 19587 Vibrating Bell

Faraday Signal Systems are made for every requirement—high or low voltage systems, buzzers, vibrating bells or single stroke bells, resistance panels, flush or surface type push buttons.

They are not only a passenger convenience but a real help to car operators because they signal stops *definitely*.

Faraday Signal Systems make a definite bid because of their RELIABILITY and long service. You can't go wrong in installing them.

No. 19403 Buzzer

ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, New York City.

Branches—Bessemer Bldg., Pittsburgh; 88 Broad Street, Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton; Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

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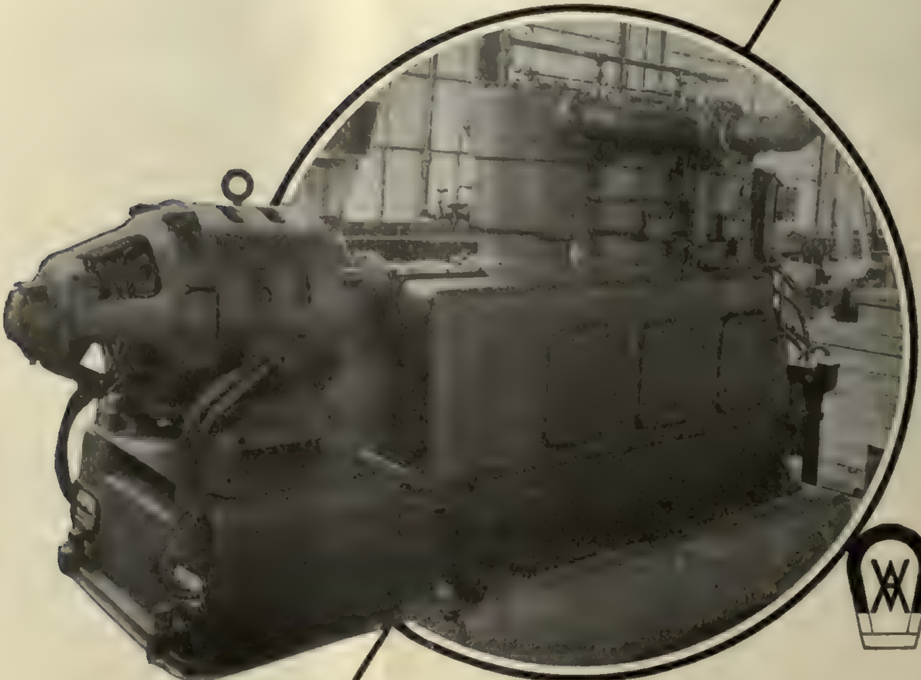
Air Compressors



POWER HOUSE

CAR BARN

SHOP

Wherever there is a need for compressed air on street railway properties, Westinghouse-National compressors can and are being used. For every requirement—in power house, car barn, shop, or on the right of way—there is a suitable type and size available (ranging from 3 to 700 cu.ft. displacement).

When you think compressed air for any purpose, think Westinghouse-National!

Westinghouse Traction Brake Company
General Office and Works: Wilmerding, Pa.

"QUALITY MACHINES FOR QUALITY SERVICE"

You wouldn't treat your new cars this way...

of course not! It's absurd!

BUT is it any more absurd than pounding modern, luxurious, new cars over rails where every joint means a bump?

How can the motorist be lured from his rubber-tired, shock absorber equipped sedan, to ride on the finest trolley car in the world, if the track is bad?

Think it over!

Give the modern cars a chance to show what they really can do.

THERMIT WELD THE RAILS AND ELIMINATE THE JOINTS.

THERMIT

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

THIS MAN IS COMFORTABLE AT HOME
CB

IS HE COMFORTABLE IN YOUR CARS?

When a chair at home is too near the heat or too far from the light, it can easily be *moved* into proper relation. But the seats, lights, windows and heaters on a trolley car are in a *fixed immovable position.*

Once uncomfortable upon a car—always uncomfortable. It is necessary, therefore, to bring these factors into right relation at the start and a Hale & Kilburn seating engineer, working with you from the beginning of the design of the car, will assure the maximum degree of final comfort.

We have half a century's experience to aid, not only in providing the most practical *arrangement* of these comforts, but in providing the most practical and comfortable type of *seat* for every type of city and inter-city service.

The H. & K. No. 900D Double Chair has brought street railway seating to the highest point of modern luxury and comfort. It is, however, but one of the many Hale & Kilburn styles developed to fulfill this function in all fields of transportation.

HALE & KILBURN SEATS

"A Better Seat for Every Type of Modern Transportation Service"

HALE & KILBURN COMPANY

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W. D. Jenkins, Praetorian Bldg., Dallas, Texas
H. M. Euler, 146 N. Sixth St., Portland, Oregon

GOLD

1929

When railroads first took to the air . . . .

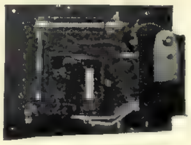
AUTOMOBILES were unknown . . . and people tapped their foreheads significantly when bold thinkers prophesied that some day men would fly. New York did take to the air by building the "L", powered by small steam locomotives.

Even at that date cars were warmed with apparatus made by the Gold Car Heating & Lighting Company. Then, as now, Gold equipment was supreme in the field.

Ever since railways of the 70's replaced wood-burning stoves with Gold's first heater, the Gold Company has periodically introduced new and better ideas in car heating. This long and successful experience is crystallized in today's advanced Gold heating equipment.

There is a type of Gold apparatus for every variety of passenger coach, both in the steam and electric railroad fields.

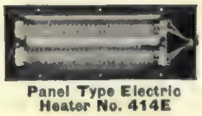
Send for the GOLD catalog. Free upon request.



Thermostat Switch
No. 1400

Cross Seat Type
Electric Heater
No. 405E

Thermostat
No. 1250



Panel Type Electric
Heater No. 414E

GOOD AS GOLD NEW YORK

GOLD CAR HEATING & LIGHTING COMPANY

Bush Terminal Bldg. No. 2
220 36th St., Brooklyn, N. Y.

In Canada: CANADIAN GOLD CAR HEATING & LIGHTING CO., LIMITED, 728 St. James St., Montreal

Here All Steps Lead to One Goal
...Multiplied Mileage

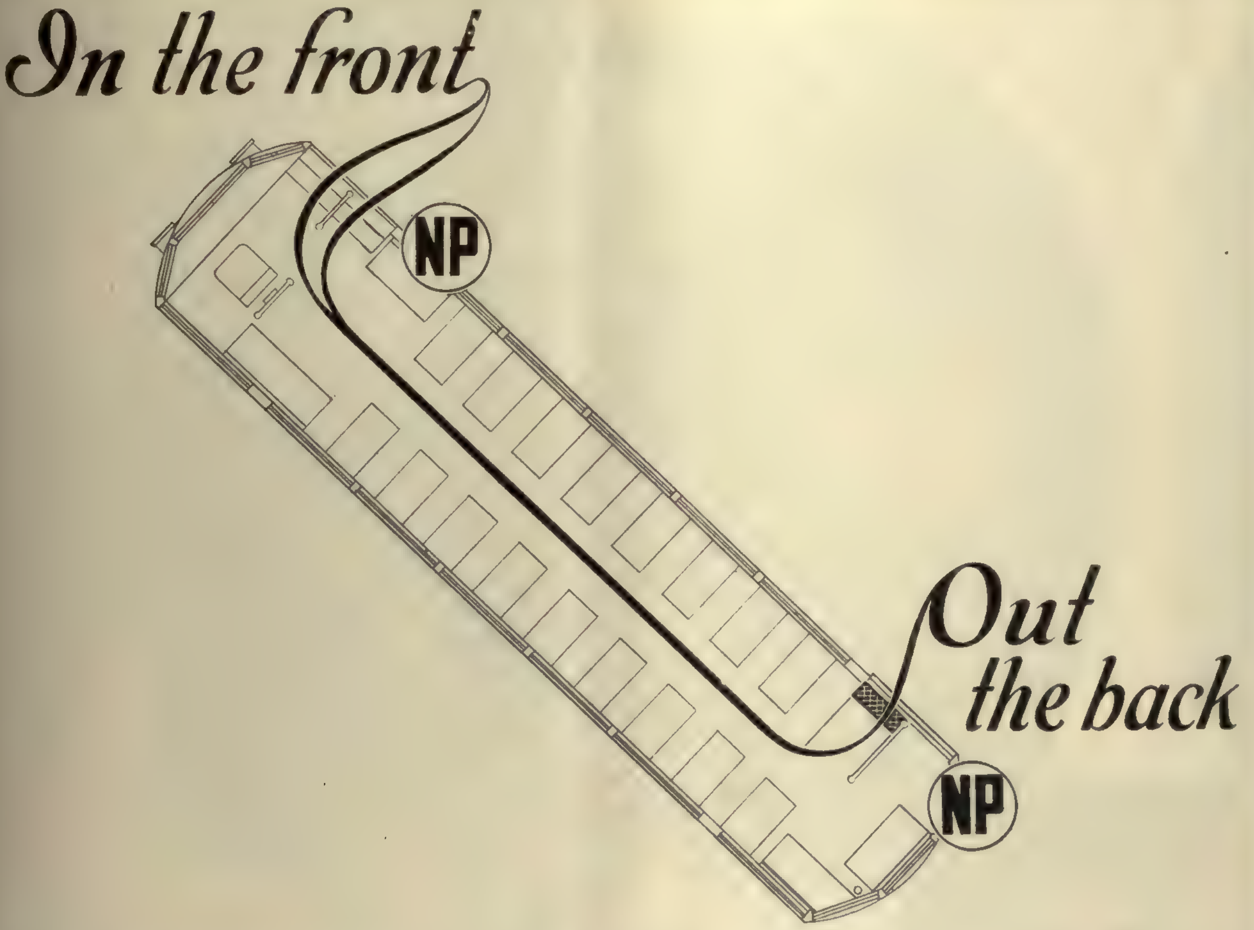
In the coning operation—last of the "hot" operations—the Gary Wheel, having been forged, rolled and punched, is placed in the loose dies of a press, where sufficient pressure is exerted by the ram [also equipped with loose dies] to give the web the proper curvature, or "cone." Here minor variations in rotundity are also corrected.

. . . . . . From wheel blank to finished product, the process of making Gary Wheels is a series of "steps" leading directly to Multiplied Mileage. The buyer receives the advantage of modern equipment, careful manufacture and painstaking inspection, resulting in a superior type of wheel.

Our wheel engineers are at your service.

Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices: 208 South La Salle Street
Chicago, Illinois

GARY
WROUGHT STEEL WHEELS



TREADLE-IZATION

Circulating load provides the only practical means of handling heavy traffic without blocking and congestion by the boarding and alighting passengers. The adoption of this system calls for a new method of controlling doors—and this new method is treadle-ization.

NATIONAL PNEUMATIC COMPANY
Executive Office: Graybar Building, New York
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CHICAGO
518 McCormick Building

MANUFACTURED IN TORONTO, CANADA, BY
Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
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Exclusively A "Bridgeport" Product

"PHONO-ELECTRIC," the peerless contact wire, is exclusively a product of the Bridgeport Brass Company. Developed in 1896 and perfected over the past 30 years, it is known 'round the world.

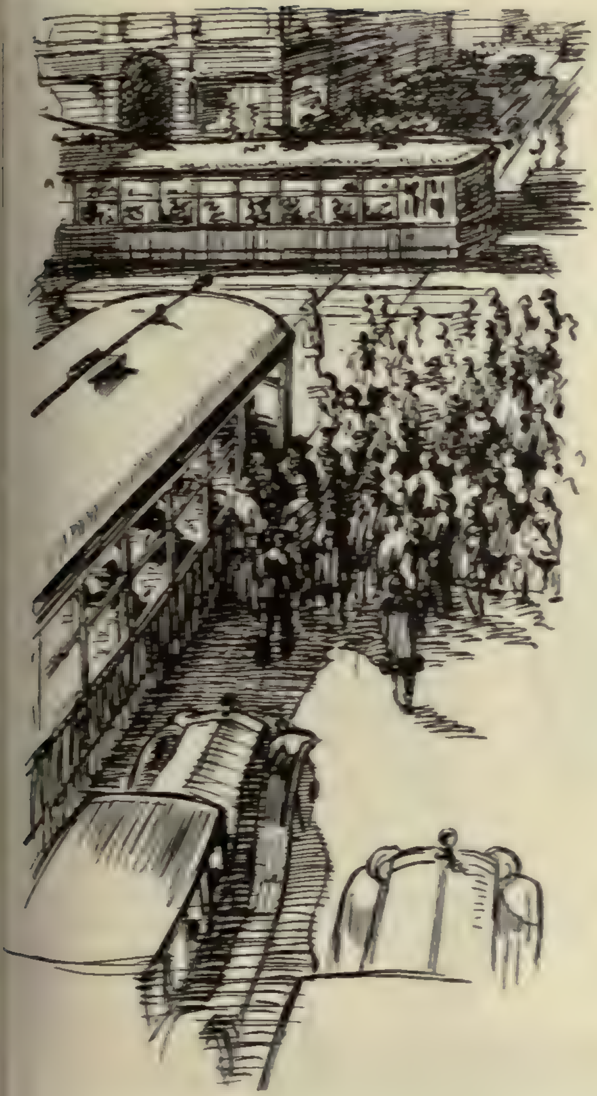
"Phono-Electric" bronze alloy has over three times the life of hard drawn copper contact wires. It has tensile strength approaching that of steel. All accessories of overhead construction, such as bolts and clamps, can be made from this alloy and give the utmost satisfaction.

"Phono-Electric" span wires are now available and provide the same economies over steel spans that "Phono-Electric" trolley wire gives over copper.

"Phono-Electric" is more than an alloy. It is a material produced by highly specialized manufacturing qualities. Send to headquarters for full, authentic facts.

"Phono-Electric" Bronze Alloy TROLLEY & SPAN WIRE

BRIDGEPORT BRASS COMPANY General Offices, East Main St., BRIDGEPORT, CONN.



Where quick stops
are the rule—

How about your *wheels?*

Flashing traffic lights, whistles, stop signals necessitate frequent braking and short stops. The wheels and axles of modern cars must absorb the punishment and deliver their full mileage.

"Standard" Wheels and Axles are standard on modern cars.

Rolled Steel Wheels

Armature Shafts

Axles and Springs

"FOR EVERY TYPE OF CAR

IN EVERY TYPE OF SERVICE"

STANDARD STEEL WORKS COMPANY
PHILADELPHIA, PA.

BRANCH OFFICES:
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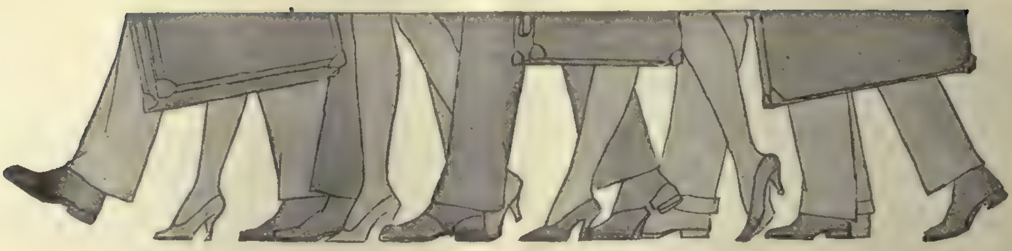


Thousands of shuffling feet daily test this light weight car flooring*

THE heaviest passenger traffic in the world—the wear and weight of the crowds that daily travel in the subways of New York and Boston—could be safely supported by Johns-Manville Truss Plate Car Flooring.

Greater Strength — Lighter Weight — Longer Life

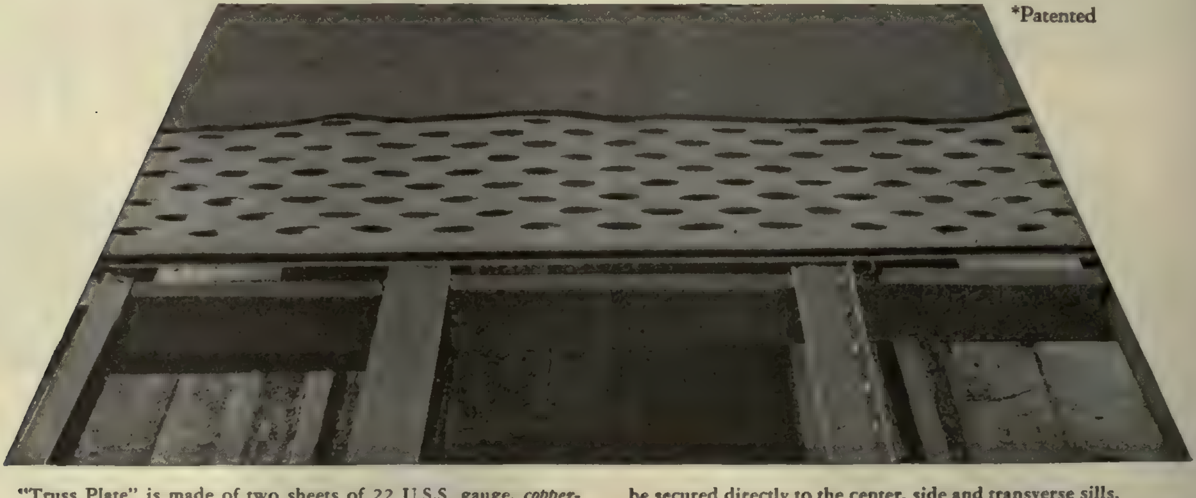
Johns-Manville Car Flooring not only meets the severest passenger car requirements, but reduces the weight of steel car flooring about 25%. Figured conservatively, this means a saving of 1000 lbs. on the average car floor weighing about 5000 lbs. The power saved in hauling this unnecessary dead weight will actually pay for the floor in a very few years.

Although lighter in weight than any other car flooring, J-M Car Flooring contains almost twice as much steel and has 4 times the bracing stiffness of any other car floor construction. J-M Car Flooring consists of "Truss Plate," a *copper-bearing* steel subflooring and Masticoke, a wearing surface with an asphalt base.

J-M Car Flooring can be installed at a cost no greater than other types. It is both fireproof and water-proof and has high insulating efficiency.

Every car builder and every railroad official concerned with keeping down his costs on passenger rolling stock should have a copy of our booklet which gives the complete story of J-M Car Flooring. The coupon will bring it to you promptly.

*Patented



"Truss Plate" is made of two sheets of 22 U.S.S. gauge, *copper-bearing* steel which are braced against each other in parallel planes through the medium of staggered rows of oval cones pressed into the sheet. This construction forms a continuous series of trusses which provide the greatest mechanical strength with the least weight. "Truss Plate" may be applied to any car construction either directly or over the steel floor plate, or, where this plate is eliminated, can be secured directly to the center, side and transverse sills.

The Masticoke wearing surface of this J-M Car Flooring is of asphalt composition, light in weight, durable, easy to apply and repair. Due to its tough, resilient structure, Masticoke will not crack nor split under impact, nor will vibration or car-weave affect it. Masticoke has a *non-skid* surface, is sanitary and odorless and is furnished in dark gray and six attractive colors.

Masticoke is being applied over hundreds of old wood floors in traction cars and buses

Johns-Manville
SERVICE TO RAILROADS

JOHNS-MANVILLE CORPORATION
New York, Chicago, Cleveland, San Francisco, Toronto
(Branches in all large cities)

Please send me your free booklet "Reducing the weight of car flooring."

Name..

Company..

Address..

R-115-3

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PATENTED
SAFKAR
TRADE MARK REG.
SAFSTEP

Two dominating considerations point the way to your adoption of these all-steel safety steps:

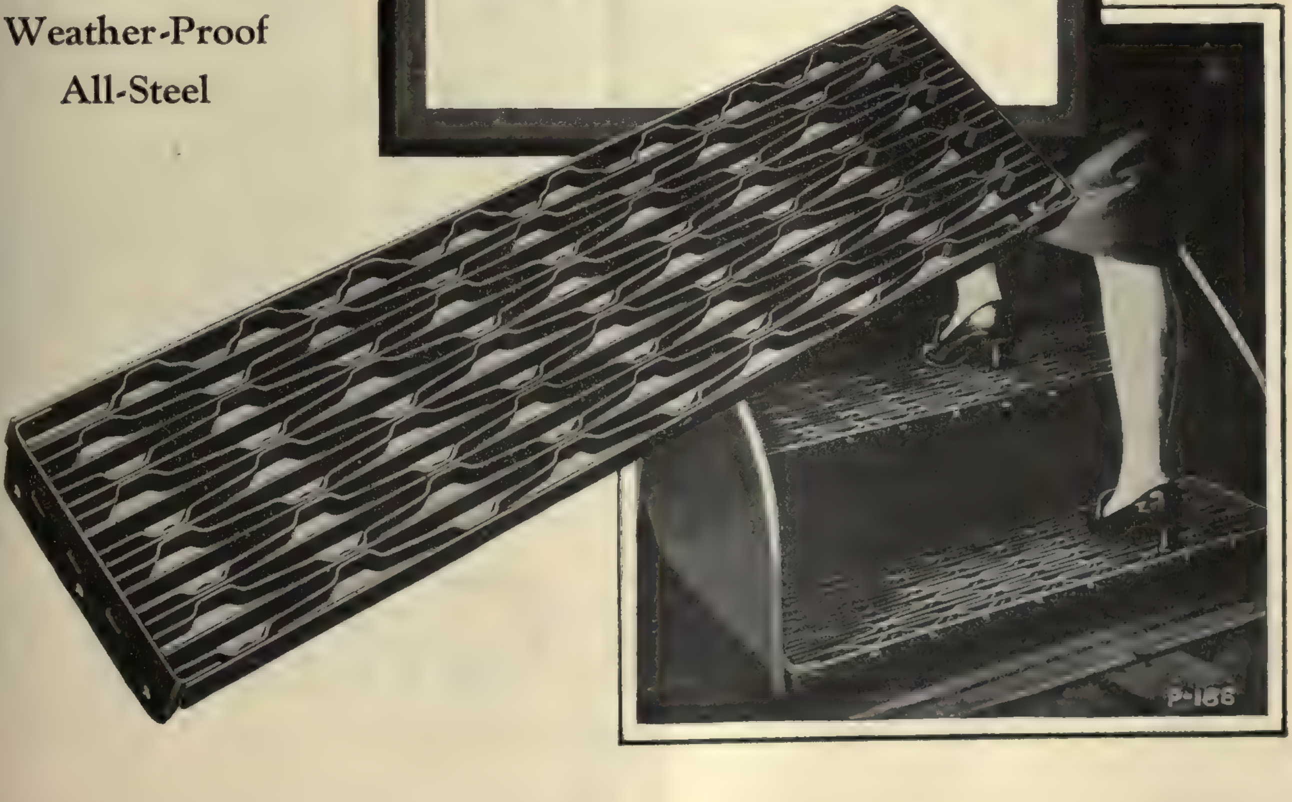
Passenger Safety against the all-too-frequent "step accidents" which may result in costly damage claims.

Operating Economy resulting from the elimination of all car step maintenance and a lower cost of car cleaning.

Let us send Bulletin 2D28.

IRVING IRON WORKS CO.
LONG ISLAND CITY, N.Y. U.S.A.
Established in 1902
SALES OFFICES IN ALL PRINCIPAL CITIES
See Your Telephone Book for Local Address

Slip-Proof
Miss-Proof
Self-Cleaning
Time-Proof
Weather-Proof
All-Steel



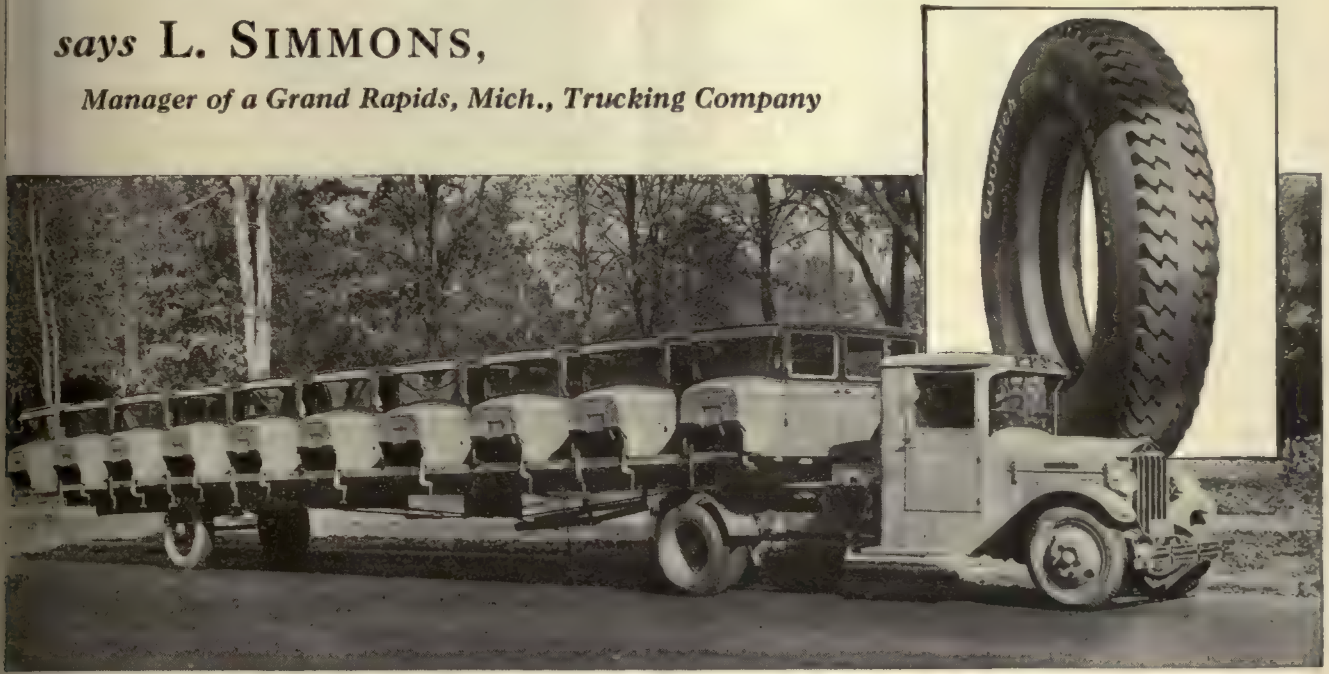
Car Card Advertising
Almost Everywhere!

BARRON G. COLLIER
INC.
NEW YORK CITY

"Going Goodrich enabled us to make more profits,"

says **L. SIMMONS,**

Manager of a Grand Rapids, Mich., Trucking Company



Ten new Whippet bodies ride on a Silvertown equipped truck-trailer owned by the Service Trucking Co. of Grand Rapids, Michigan, between Grand Rapids and the Whippet plant at Toledo, Ohio

The "water-cured," stretch-matched cord, twin-beaded Silvertown Heavy Duty Cord Tire . . . for Trucks, Buses and Trailers

BODIES for Whippet automobiles are made in Grand Rapids, Michigan. he Service Trucking Co. delivers them loads of eight, nine and ten to the oledo, Ohio, assembling plant with a leet of Silvertown tire-equipped trucks nd trailers.

"With the passing of the year 1928," rites L. Simmons, Manager of the Servce Trucking Company, "we find we ave many things to look back upon hich gave us considerable pleasure and nabled us to make more profit.

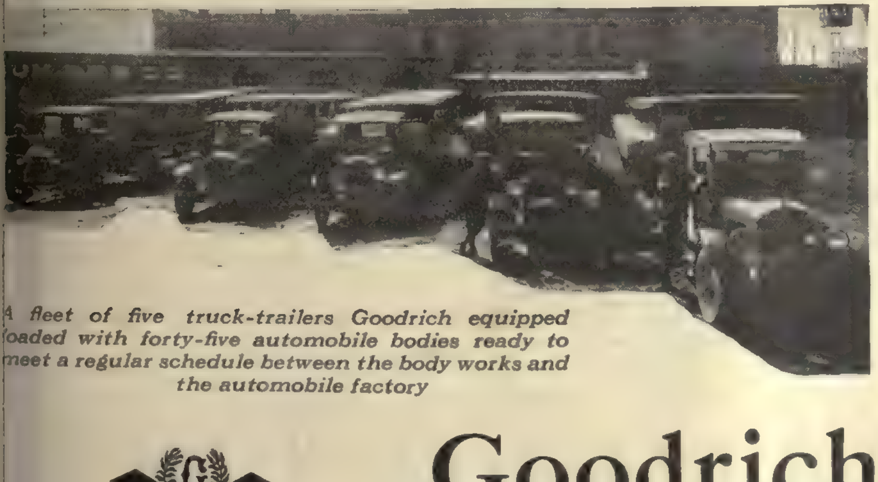
"One of the things that has proven very profitable is the use of Goodrich Truck and Bus Tires on the greater part of our fleet of 115 trailer trucks. As you know, it is essential for our drivers to keep their trucks in service without delay. Our trucks and trailers, which on an average carry nine bodies on a 200-mile trip from here to Toledo, must keep traveling so as to permit of efficiency in operating the trucks as well as the fulfillment of our promise to deliver automobile bodies on time.

"Prior to going Goodrich we were using various brands of tires, some of which were good and some not so good. Generally speaking, our drivers found many delays occasioned because of flat tires, some of which were defective and some injured.

"It is a pleasure to be able to tell you that since using Goodrich, we have practically eliminated road delays with the exception of those that come from a tire which has been run so many thousands of miles that it is worn out. We have fewer injuries and literally no hold ups because of defective merchandise. Our drivers are all very pleased and so are we.

"Mileages range from 30,000 to 75,000 per tire."

When you buy truck tires specify Goodrich Silvertowns.



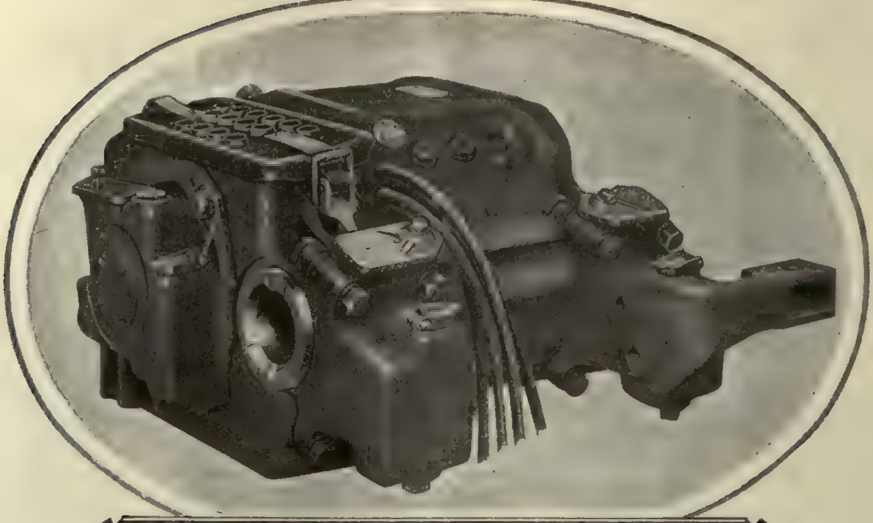
fleet of five truck-trailers Goodrich equipped oaded with forty-five automobile bodies ready to neet a regular schedule between the body works and the automobile factory

* * *

The B. F. Goodrich Rubber Company, Akron, Ohio, Established 1870, Pacific Goodrich Rubber Co., Los Angeles, Calif. In Canada: Canadian Goodrich Co., Kitchener, Ont.

Goodrich

HEAVY DUTY SILVERTOWNS



The GE-265 Railway Motor

81 original orders - 3280 motors
89 repeat orders - 4270 motors
Total - 7550 motors

Operators' appreciation of the GE-265 motor is shown by the fact that 81 original purchases involving 3280 motors have prompted 89 additional purchases, bringing the total to 7550 motors.

The City of Detroit, for example, has added seven times to its original 200 motors, until it now has 1764 motors. The Georgia Railway and Power Company has added ten times to the original equipments; and the United Electric Railway of Providence, six.

Such appreciation on the part of these large operators is due to the unsurpassed performance of GE-265 motors.

330

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN ALL PRINCIPAL CITI

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

McGraw-Hill Publishing Company, Inc.
James H. McGraw, *Chairman of the Board*
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H. C. Parmelee, *Editorial Director*

CHARLES GORDON, *Editor*

Louis F. Stoll, *Publishing Director*

Volume 73 New York, Saturday, March 23, 1929 *Number* 12

Looking to the Future

SPEAKING a short time ago before the public utilities committee of the Philadelphia Chamber of Commerce, and more recently before the Boston Chamber of Commerce, General W. W. Atterbury, president of the Pennsylvania Railroad, expressed a far-sighted view of the country's transportation problems that is worthy of more than passing attention on the part of local transportation men. It is in the fact that General Atterbury seems to recognize, particularly in his Philadelphia address, the close relation that exists between the development of railroad terminals and the local transportation facilities of a large city that his remarks are of greatest interest to readers of the Journal.

As a matter of fact, it becomes increasingly evident that one of the major factors, if not the most important single problem in planning for the present and future of the country's long-distance rail carriers, is that presented by the terminal situation in large cities. In its physical aspects alone, terminal planning presents to the railroads, as well as to large communities themselves, many serious and highly controversial problems. But when viewed from the standpoint of economics, and particularly when considered in combination with the economic problems of local transit, the situation becomes complicated indeed. In his Philadelphia address General Atterbury dealt primarily with a conception of a 50-year transportation program for the Pennsylvania Railroad. But he also advanced the idea of co-ordination of all forms of transit in the city as a means of utilizing most efficiently all facilities now available or to be constructed in the future.

At first this may seem merely a recognition by a steam road man of a principle which the local transportation industry has set up for some time as fundamental. But it is easily possible to attach far broader significance to General Atterbury's remarks than may seem evident on the face of things. It seems worthy of note that this public discussion of the community transportation situation by a man who occupies a place in the public eye and in railroad circles as prominent as does the president of the Pennsylvania Railroad, follows an intensive study of the whole terminal situation in the entire area lying between Philadelphia and New York. Furthermore, it follows closely on the announcement of a $100,000,000 electrification program in this area resulting from these studies, which is designed to meet the transportation requirements of a New York metropolitan area expected to contain 30,000,000 people by 1950, and to extend from New Brunswick on the west well out on Long Island on the east.

In addition to all of this, about the same time that General Atterbury was speaking in the east, there came the announcement from Cleveland that the Van Sweringens are engaged in developing in that city a combined terminal and community transportation project which is to include the Cleveland Railway and future rapid transit lines, as well as the trunk-line railroad terminal plan which they originally undertook to work out. When these facts are taken together they indicate an approach to the idea of co-ordination of community transit which transcends in its extent any ordinary conception of recent years.

Most significant of all, therefore, is the evidence here indicated of the way in which present-day railroad planners are looking at the terminal transportation situation. Even on the face of things, the projects in the New York and Cleveland areas are gigantic in proportions and daring in their conception—in keeping with the modern tempo of business and industrial development of the country. But, in addition, they seem to go further than the railroad man has been inclined to go in the past, in recognizing the relation between transportation within a community, the development of the community itself, and consequently the terminal problem of the railroads.

Whether or not this attention to intra-community transportation on the part of the railroads will be accompanied by recognition of certain basic economic principles that have been established after long and in some cases disastrous experience, remains to be seen. Present indications and railroad precedents, however, do not point in that direction. The question that may be expected to loom up with increasing importance in the future, if railroads undertake to play a major part in community transportation, is that of whether rights-of-way for local transit facilities should be or can be financed with private funds. To attempt to do so is a step in the wrong direction, for it is a step away from the principle that local transit rights-of-way of a city constitute merely specialized forms of streets for the movement of its citizens and should be financed by assessment against the property benefited by their construction.

Public Relations—Plus

SEVERAL weeks ago in a large Southern city the Chamber of Commerce was preparing to elect a new board of directors. Among the names under consideration was that of the public relations official of the local railway. The president of the company was already a member of the board and his re-election was a foregone conclusion. This meant two votes for the railway interest in addition to a much coveted honor for the young public relations man.

In the meantime, however, officials of a civic club which had never had any representation on the board sought recognition. An appeal was made to the electric railway president by the secretary of the club. Without a minute's hesitation the railway official, one of its most valuable members, offered his place on the board, but the publicity man heard of this and promptly said that if there was any "stepping down" he was going to do it. The net result was the election of a member of the civic club to replace the publicity official.

The story does not end here, however. Another claim for representation equally as just then came up. This from one of the largest railroads in the country which had its general offices in the city and employs thousands of workers in its shops. Again the electric railway president offered to resign. The sequel to this was the election to the board of the railroad executive and the elevation of the electric railway president to the post of vice-president of the Chamber. This meant, of course, the loss of voting power by the man chosen to represent the electric railway.

Recognition of this disposition of the electric railway men to efface themselves is best expressed perhaps by the letter written to the publicity man by the secretary of the civic club, who said: "The good will shown by you and other officials of this company is one that makes us all feel proud to live in a community where there are so many broadminded men and men that are willing to sacrifice personal ambitions and honor for the benefit of the community and to the end that they are always willing to do what is right and fair, regardless of their interests." If the man who received this letter were to admit that it warmed the cockles of his heart, that certainly would be nothing against him.

Not a Job for Amateurs

ADVERTISING constitutes one of the electric railway's major means of reaching the public. It is generally agreed that a properly conducted advertising program wins rides and creates public good will. When guided by experienced hands, such publicity plays an important and essential part in the conduct of a public transportation business under present-day competitive conditions.

Recent advertising campaigns by a number of electric railways in this country and Canada, as outlined in last week's issue of Electric Railway Journal, indicate remarkable development in this field. The Portland Electric Power Company some time ago completed an extensive newspaper campaign, selling the company's service, at the same time celebrating the property's twentieth anniversary. Service and safety were featured throughout the entire campaign, these features being linked with the growth of the company during the past twenty years. The Kansas City Public Service Company recently concluded an advertising series with an ad paid for by the employees, featuring a creed expressing the employee's duty to the public.

The Montreal Tramways devised an unusual means of awakening the interest of Montreal's citizens to historic and interesting points in and near Montreal, and has furnished authentic and accurate information that would be appreciated by visitors to the city. The British Columbia Electric Railway has conducted an extensive educational campaign through poster advertising. The New York State Railways has used newspapers extensively to discuss with the public its policies and plans. These and many other companies operating local transportation systems have presented their messages clearly, simply and frankly and have displayed striking ingenuity in winning the attention and the interest of the public.

Of even greater significance, however, is the fact, as indicated by recent campaigns, that electric railways are fast learning that poorly-executed advertising is not only of little value but may actually become seriously harmful in its effect on the public. Current advertising shows, on the whole, a wholesome absence of the plaintive or complaining type of "poverty" copy which only recently was too often found in electric railway advertising. Typical recent electric railway advertising attracts attention, induces constructive thinking and avoids criticism. These features indicate the work of experts, not amateurs. They emphasize the fact that the inexperienced have no more place in the management of electric railway advertising than they have in the management of an electric railway itself.

Duplicate Tracks Dilute Service

EXAMINATION of the routes of street railway companies in many cities discloses an evil which is far too common, and toward the correction of which relatively little has been done. This is best described as surplus or duplicate trackage near the centers of cities, resulting in many instances from competitive construction during the promotional days of the industry. It is likewise far too common in these cities to find the needs of large sections of outlying territory inadequately served with public transportation, due to the fact that financial resources are drained by the necessity for running unprofitable duplicate service on streets sometimes only a block or two apart.

This situation holds back the progress of an entire property. In the first place it becomes necessary to maintain many miles of unnecessary track and paving. But even more important from the standpoint of the effect upon earnings, this condition is frequently found to result in a dilution of traffic to the point where headways are excessive. The net result is that there are several lines in close proximity, serving the same general residential section and running into the same general business district, on all of which the service is unattractive because of long headways between cars.

During the past several months the importance of frequent headways as a factor in attracting riding has been strikingly demonstrated. One of the most outstanding examples of this is in Chicago, where despite the general trend in the industry toward a more and more unfavorable load factor, the Chicago Surface Lines has been able to build up off-peak riding through greater frequency of service during those hours. The relative importance of speed and headway as factors in winning increased business is difficult of determination, but it is quite probable that under certain conditions the importance of frequency cannot be over-stressed.

A recent experiment by a railway in a medium-sized city throws into sharp relief the situation resulting from unnecessary duplication of lines in the same territory. On this property one of two such lines was changed to one-man operation and the service increased by a large percentage. On the parallel line the former service was retained. As a consequence of the cut in headway on the one-man line, there was a large immediate increase in revenue and in the revenue per car-mile operated. At the same time there was a drop in revenue on the parallel line which had not been changed. Observations made in the district soon disclosed that in many instances passengers were walking several blocks, *crossing* the line which maintained its former headways, and patronizing the line two blocks away which offered frequent service. In other words, they were willing to walk two extra blocks to the line on which they were sure to get a car with little waiting, rather than to take their chances on waiting for a car to come on the line which was closer to their homes.

Thus it seems more than probable that needless duplication of lines in many cities is causing dilution of service which tends to drive away much-needed revenue. Of course there is usually serious objection from property owners and business people on the affected streets, to the elimination of existing tracks, even though the line is proved to be a needless and unjustified duplication. For some strange reason, property owners and business men assume the right to demand retention of a car line though they have for many years been deaf to its difficulties, and contribute not a penny toward its revenues. The reason is, of course, quite clear. They recognize the property value that is created by the existence of a permanent transportation line in the street. Perhaps a new line of attack is necessary. If the surplus trackage is of such value to them, why not propose that they purchase this track from the railway on the condition that service will be maintained? The possibilities resulting from acceptance of such a proposal provide an interesting field for speculation.

"Horse-Car Days"

CONTRIBUTING to the *American Mercury* seems to have become a habit with Raymond L. Tompkins of the United Railways & Electric Company, Baltimore, Md. This time Mr. Tompkins is in no way captious. His subject is "Horse-Car Days." It does not seem possible that Mr. Tompkins could have drawn much on his own recollection for the facts he sets down. He is too young for that. And the facts are too multifarious for him to have been an observer of any considerable number of them. But again he proves himself to be an able raconteur.

Many men still living were witnesses to some of the events he recounts. In fact, any number of such men could be named. They are practical fellows, and while discarded horse cars may be difficult to find, as Henry Ford learned during his recent search for a museum specimen, there are still a few of them tucked away here and there. And there are some that are not tucked. True, they may not be exactly horse cars, but they are still in service, more's the pity.

It would be reasonable to wager that Tom Minary, octogenarian, who in his day could flick flies off a horse's ears with a whip along with the best of them, has an old horse car stowed away somewhere in Louisville. Unlikely is it that from the recollection of Horace Lowry, son of the late Tom Lowry, has faded the picture of the early struggles in the Flour City. Many who are still alive can recall the dreadful epidemic of epizootic of which Mr. Tompkins writes. And there are many who recall the proceedings of the first street railway convention with its topics so remote from the subjects that are discussed today. The veterinary and the horseshoer have given way to the engineer and the economist, but the problem of making a cent go as far as it will is even more acute today than it was in the horse-car days. Those were the days when a nickel had real purchasing power.

There is no occasion to take issue with Mr. Tompkins. He has done a good job. In fact, the period about which he writes seems but yesterday to many transportation men. And the list of men still in the industry who are able to recall them is a long one. Fondly as they may recollect the happy days of long ago the oldest of the Old Guard must admit that the progress of the local transportation industry in the past 45 years has made reminiscences of the first convention but a memory indeed.

A Sound Demand for Revision of Fares

MILWAUKEE can afford to deal liberally with its railway in the matter of fares. The company has dealt generously with the city. It has anticipated the city transportation requirements. Not only has it kept up the city lines to a high degree of perfection, but it has co-ordinated bus operation with them and has planned suburban transit on a liberal scale designed to anticipate the future growth of Milwaukee as a metropolis. All that the company asks is that the Railroad Commission shall fix boundaries of a single-fare area and adopt rates which would put the city and suburban transportation system on a self-supporting basis. Certainly, this is reasonable.

The Milwaukee company's investment in its railway has increased from $16,694,409 in 1920 to $28,263,980 in 1928. Not in any year since 1920 has the company earned an adequate return on its investment in the railway. Where there have been deficits from railway operation, they have been made up from the revenues of the electric department. Economically, this is an anomalous situation. The promise of the company is that if standards of service and rates of fare to be prescribed are so calculated that they will yield an increased return upon the railway and bus service, the company will reduce electric rates by an amount not less than the estimated increase in railway revenue. Present fares are 7 cents with transfer, and eight tokens for 50 cents.

The whole matter is before the commission because of the demand for an extension of the single-fare limits to include former North Milwaukee, now a part of Milwaukee. To meet this demand would eliminate zone fares on that line. The position of the company is that the zone system of fares is most fair and equitable. It regards this as tenable economically.

Like nearly every other American city, Milwaukee has suffered because of the need of keeping available for service equipment to meet the occasional peaks in traffic. This necessitates a large amount of money being tied up in equipment over and above that required to carry the regular load. For instance, in January of this year from 50,000 to 70,000 more casual riders were carried on certain days than in a similar month last year. The position of the company is that under present rates regular riders are discriminated against. The feeling is the occasional rider should pay a fare higher than that of the regular patron, and that the regular riders should pay the minimum rate that is possible. This is sound. It will be interesting to review the basis on which the commission disposes of this matter, since that decision will probably involve not only the regulatory body's idea of fairness to the railway, but also of fairness to the frequent and the occasional user of the transportation service. It is an old question, this one of the demand for extension of fare limits, but apparently each time it arises it must be settled anew.

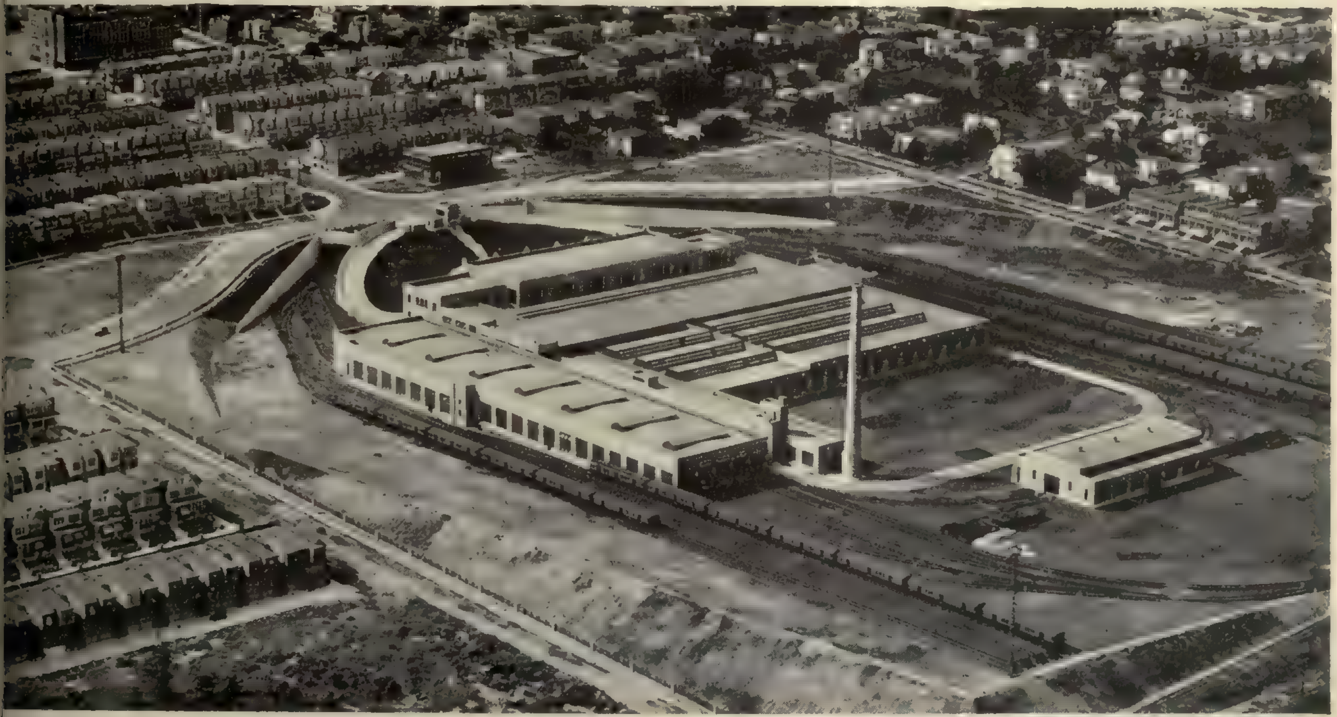
Views of the Fern Rock Terminal Yard and Shops of the Broad Street Subway, Philadelphia

Above—The architectural detail of the entrance building with its limestone trim, polished granite base, doorway fixtures and grille work is typical of the attention paid to the design of all the buildings. At right—Eleven storage tracks are located on the north side of the general repair building, and land is available for fourteen more. This view, taken during construction, shows the white porcelain insulators before the contact rails were laid. Below—The landscaping of the area in front of the main building makes the terminal very distinctive.

Elaborate Shop and Yard Facilities

Provided for Philadelphia Subway

Fern Rock terminal is conveniently located at north end of Broad Street subway. Architectural treatment of buildings, landscaping of grounds, flexible track arrangement and an array of modern machinery are the outstanding features



Aero Service Corporation, Philadelphia

erial view of the Fern Rock terminal yard and shops showing the general layout of the buildings and tracks. The inspection shop is at the left and the main repair building at its right. Note also the portals, the entrance building, the storage building at the rear, the two track loops, the steam railroad connection, the road encircling the main building, the floodlight towers at each corner and the steel and concrete fence which encloses the area

This article is the fourth and last of a series, describing the new Broad Street subway in Philadelphia. The first, published on Feb. 9, showed the relation of the subway to the existing and future transit facilities of the city, and gave operating and construction details. The second article, in the Feb. 23 issue, described the 150 cars bought by the city, and the third, published on March 9, gave details of the power distribution and signal systems.—Editor.

CARHOUSING and maintenance facilities for the new Broad Street subway, designed and built by the Department of City Transit of Philadelphia nd being operated by the Philadelphia Rapid Transit ompany, are provided at the extreme north end of the ne. The terminal, known as the Fern Rock yard and shops, was constructed and equipped at great cost and is outstanding in many respects. The architectural treatment of the buildings and the landscaping of the grounds were carefully detailed and the resulting appearance is unusually attractive for a car shop. The terminal is made even more distinctive on account of the flexible track arrangement for the yard and shops, the large number of modern machines and tools, and the provisions made for expansion.

Advantages of the Site Selected

The site selected for the storage yard and shops is bounded by Chew Street, Nedro Avenue, Marvine Street and the Reading Railroad right-of-way, and embraces an area of approximately 32 acres. Its nearness to Broad

Street, the favorable topography and the adjoining railroad made the site particularly suited for the terminal. With the exception of a few houses on the northern front, the track was totally undeveloped, with no streets opened through it, although the city's street plan provided for five north and south streets and one east and west street, running through the property. It was decided to divert Eleventh Street so as to skirt the western part of the tract, to arrange the yard grade so that another street could be opened beneath the tract when necessary, and to remove the others from the street plan. The plot required a fill on the east end, the spoil from the subway excavation being used for this purpose.

The terminal facilities include a shop for the periodic inspection of all cars operating from this yard; the general repair shop for overhauling and repairing all cars operating on the Broad Street subway, or that may operate on its future extensions, tributaries and connecting lines; an open track storage for cars when not in use; a storage building and yard space for materials used in maintenance of permanent way, buildings, station equipment, etc.; and a steam railroad connection for the receipt and shipment of freight.

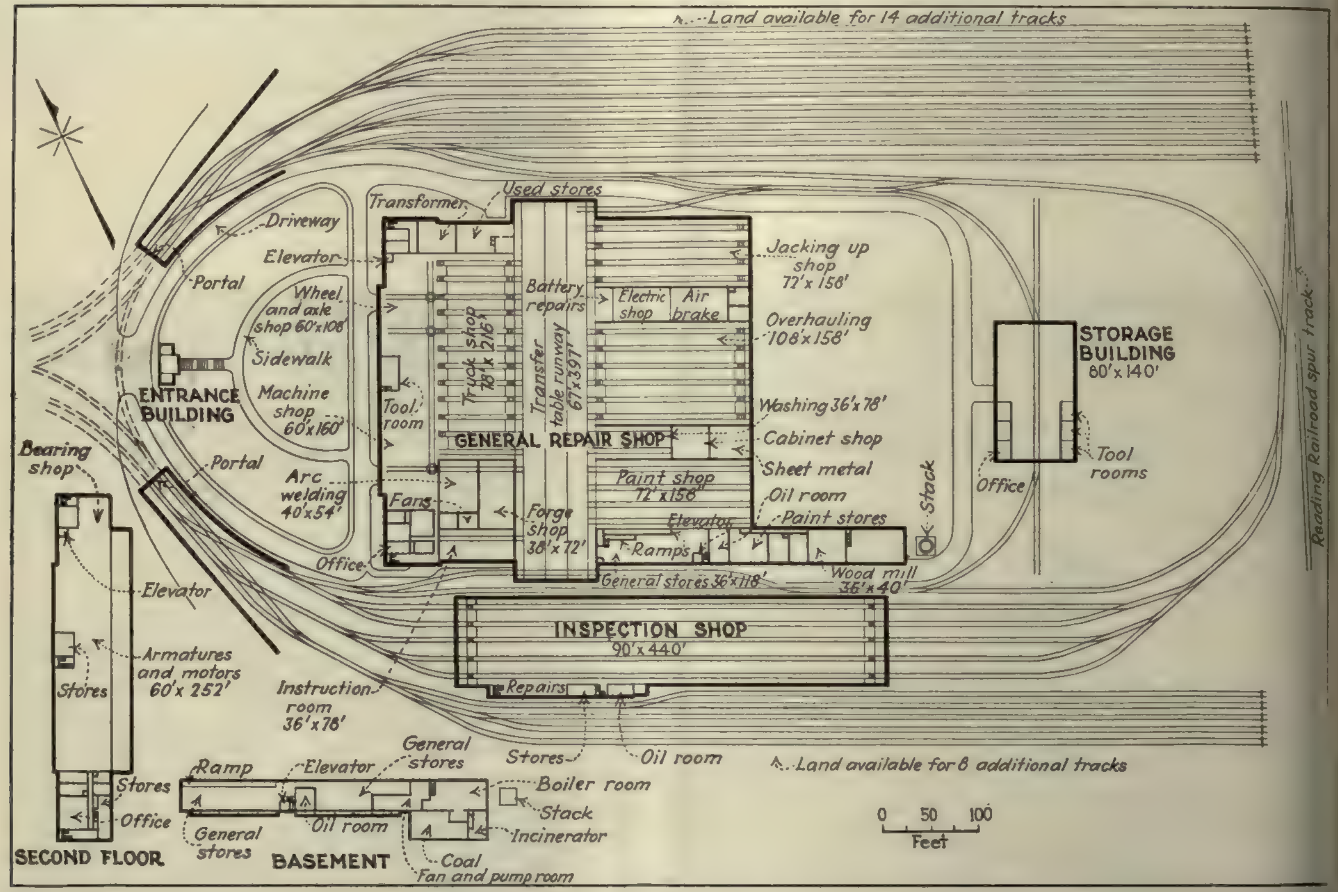
STORAGE TRACKS ACCESSIBLE FROM SUBWAY AND SHOPS

Convenient and direct access to all storage tracks and to the inspection and repair shops was sought for and attained in the yard design. The plan selected divides the storage yard into two parts, one on the north side of the plot and one on the south side, each equally accessible to the subway through the two Grange Avenue portals which are located within the yard. By this arrangement ample space was left between the two parts for the shop buildings and other necessary storage area. The genera plan of track and buildings is shown in an accompanying illustration.

The initial track arrangement includes eleven storage tracks on the north side of the plot and five on the south side, all stub ended. In addition, there are five tracks which pass through the inspection shop and which are joined at the rear to a track which circles around the rear of the general repair shop. This track has a spu on the north side which goes to the transfer table runway in the general repair shop, and also a branch to th Reading Railroad spur. Another track, between the general repair shop and inspection shop, has a siding whic goes through the south end of the transfer table runwa and also joins the circling track at the rear. A secon track, which passes through the storage building, join the north and south storage yards. It is possible to ru a train completely around the shop, as a loop track withi the portals has been provided.

The initial track installation provides storage for approximately 165 cars. The ultimate development of th yard area, which has been kept free of all poles and overhead wires, will permit the storage of about 450 car Land is available on the north side of the plot for fourteen additional tracks, and on the south side for eigh tracks.

Entrance for automobiles, trucks and other vehicles, made over a driveway, entering from the west end of th

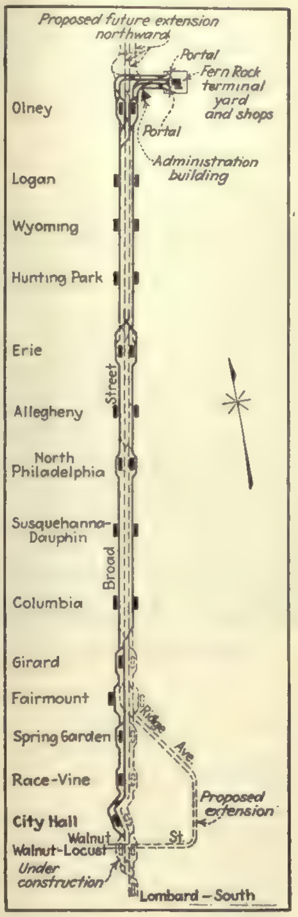


Complete track and building layout of the Fern Rock Terminal, showing the flexible track arrangement and the various departmen and shops within the buildings

ard, as shown in the diagram of the terminal. The riveway encircles the repair shop, thereby avoiding rossing any tracks except the spurs which enter the epair shop.

BUILDINGS DESIGNED FOR A RESIDENTIAL NEIGHBORHOOD

The yard and shops are in a purely residential district nd the buildings were designed and the plot landscaped o add, rather than detract, from the neighborhood. The esult can best be judged by studying the architectural reatment of the buildings, and the general effect in the ccompanying illustrations. The entrance building, which s typical, shows the close attention to detail that was paid n the design. The pearl gray tapestry brick construcion with white limestone trim, the diamond pattern n the panel over the doorway, the specially designed artouche in this panel, the polished granite base, the ron gates in the doorway, the iron grille work in the narrow windows on each side of the doorway, the imposing gateway fixtures, the general shape of the building with its two wings, the walls projected to the driveway ntrances and the iron gates for the driveway, all contribute to the pleasing effect obtained. A harmonizing reatment is given the general repair building and the nspection shop also, as may be seen in the views of hese buildings. The pattern was not confined to the fronts of the buildings, but was continued on the sides and rears. The area immediately in front of the general repair shop has driveways and a semi-circular lawn with sidewalks passing around the lawn to the foot of a stairway leading to the entrance building. The remainder of the area is tapered to these sidewalks and also has a lawn. A flagpole in the semi-circular plot, together with shrubbery and trees, carefully located, adds to the general effect. The portals and retaining walls are in white, and harmonize with the sidewalks and stairway. The entire terminal area has been cleared of unnecessary material and graded to give a pleasing appearance. An iron and concrete fence, in keeping with the general architectural plan, surrounds the entire area. The completed yard, with its fence, graded track areas and harmonizing building designs, may be seen in the aerial view.



The terminal yard is located at the extreme north end of the Broad Street subway. The administration building, north of the Olney Avenue station, is also shown on this map

LONG INSPECTION SHOP

The usual frequency of inspection requires that 5.3 per cent of the total number of cars pass through the inspection shop each 24 hours. Maximum service from the equipment demands that the largest possible number of cars be made available for rush hour periods, and as inspections can usually be made in several hours, they can be made between the morning and evening rush periods. To this end the inspection shop was made long enough to accommodate a full train, and each track connected for entrance or exit at either end. It is not expected that during the first few years of operation the trains will exceed six cars, and the inspection shop was built to accommodate trains of this length, with provision made for further extensions to accommodate eight-car trains.

The building has five inspection tracks, spaced 18 ft. between center lines to provide ample working space between the cars. All tracks are built over pits, with the floor between tracks depressed 1 ft. below the head of the rail. Double-folding doors, motor operated, are installed at both the front and the

Five tracks extend the full length of the inspection shop, which is long enough to accommodate six-car trains. The tracks are spaced on 18-ft. centers, giving adequate room for the workmen

rear of the building, each track having its individual doors. The machinery required in this shop is housed in an offset along the south side, which also provides for oil storage, general storage, work benches, office space and locker rooms for the men assigned to this building.

Arrangement of Shops in General Repair Building

The plan of the general repair shop embodies the use of a car transfer table to move cars into and out of the shop and to move cars and trucks to the various departments during the course of repairing, overhauling and painting. The building is approximately 360 ft. by 380 ft., with an L extension along the south side, 36x 160 ft. The transfer table travels 397 ft. across the entire width of the building and sufficiently beyond each side for the connections to the yard tracks. The wheel and axle, machine, truck, arc-welding and forge shops are located on the west or front side of the transfer table runway, with the motor, armature and bearing departments on the second floor, over the machine and wheel shops. On the rear or east side of the runway are located the jacking, battery, electric, air-brake, overhaul, cabinet, sheet metal, washing and paint shops.

The shops are so arranged in the building that a car can be completely overhauled with a minimum of handling. Cars entering the shop are moved by the transfer table to the jacking shop, where the bodies are lifted by 20-ton cranes and the trucks removed. The trucks then are taken to the shop on the opposite side of the transfer table runway, where they are dismantled. The motors are hoisted to the second floor by a high overhead crane operating over a well and are repaired on this floor. A separate shop for the armatures and another for the bearings further divide this repair work.

Adjoining the truck shop are the wheel and axle, machine, arc-welding and forge shops, in which the truck repairing and overhauling are completed. When the

Shop Equipment Installed in the Fern Rock Shops of the Broad Street Subway, Philadelphia

Truck Shop

4 cranes—15-ton, single hoist, floor-operated, 33 ft. 5½ in. span	Box Crane & Hoist Corp.

Wheel and Axle Shop

1 wheel press—600-ton	Chambersburg Engineering Co.
1 car wheel borer—48-in.	Niles-Bement-Pond Co.
1 combination journal and axle lathe	Niles-Bement-Pond Co.
1 axle grinder—14 in. x 96 in.	Norton Grinding Co.
1 wheel lathe—No. 2	Niles-Bement-Pond Co.
1 hoist—2-ton	Box Crane & Hoist Corp.
1 axle straightening press—200-ton	Chambersburg Engineering Co.
1 two wheel grinder—18 in. x 3 in.	Hisey-Wolf Manufacturing Co.
1 axle testing tank—3 ft. x 3 ft. x 10 ft.	*
1 heater for testing tank—gas fired, 5-hp.	B-Line Boiler Co.

Machine Shop

1 crane—5-ton, single hoist, floor-operated, 18 ft. 9 in. span	Box Crane & Hoist Corp.
1 semi-universal turret lathe No. 1	Acme Machine Tool Co.
1 engine lathe—16 in. x 10 ft.	Monarch Machine Tool Co.
1 engine lathe—20 in. x 16 ft.	Monarch Machine Tool Co.
1 engine lathe—24 in. x 14 ft.	Monarch Machine Tool Co.
1 drill press—15-in.	W. F. & J. Barnes Co.
1 drill press—21-in.	W. F. & J. Barnes Co.
1 radial drill—5-ft.	Carleton Machine Tool Co.
1 universal milling machine—No. 3	Cincinnati Milling Machine Co.
1 crank shaper—24-in.	Gould & Eberhardt
1 two wheel grinder—14 in. x 2½ in.	Hisey-Wolf Manufacturing Co.
1 bolt threading machine—2-in.	Acme Machinery Co.
1 hack saw—6-in.	Peerless Machine Co.

Machine Shop Tool Room

1 tool room lathe—16 in. x 8 ft.	Monarch Machine Tool Co.
1 drill grinder—No. 51	Oliver Instrument Co.
1 universal tool grinder—No. 2	Norton Grinding Co.

Forge and Welding Shops

3 down-draft forges	Champion Blower & Forge Co.
1 mechanical sledge	Chambersburg Engineering Co.
1 binder—Model D, 8-in.	J. R. Kerlin Co.
1 combination punch and shear—No. 20.	Heney Pels & Co., Inc.
1 single frame hammer—800 lb.	Chambersburg Engineering Co.
1 coal bin	*
1 fitting plate	*
1 stock rack	*
3 anvils—175-lb.	Paragon
1 air compressor—500 cu.ft., straight line, with 100-hp. synchronous motor	Ingersoll-Rand Co.
1 electrical welding outfit	Westinghouse Electric & Mfg. Co.

Motor Shop

1 crane—5-ton, single hoist, cage-operated, 37 ft. 7 in. span	Box Crane & Hoist Corp.
1 crane—5-ton, single hoist, floor-operated, 37 ft. 7 in. span	Box Crane & Hoist Corp.
1 engine lathe—20 in. x 10 ft.	Monarch Machine Tool Co.
1 drill press—15-in.	W. F. & J. Barnes Co.
1 two wheel grinder—14 in. x 2½ in.	Hisey-Wolf Manufacturing Co.
1 armature storage rack	*
1 armature extractor	*
1 lye tank—3 ft. x 3 ft. x 6 ft.	*
1 pinion tank—3 ft. x 3 ft. x 4 ft.	*
2 boilers—gas fired, 5-hp.	B-Line Boiler Co.
1 vertical broaching press—30-ton	Chambersburg Engineering Co.
1 transfer truck—3-ton	Easton Car & Construction Co.

Armature Shop

1 dust arrester	Pangborn Corp.
1 cleaning cabinet	*
1 two wheel grinder—14 in. x 2½ in.	Hisey-Wolf Manufacturing Co.
1 engine lathe—24 in. x 12 ft.	Monarch Machine Tool Co.
1 horizontal press—300-ton	Chambersburg Engineering Co.
6 armature stands—Peerless type A	Electric Service Supplies Co.
1 commutator slotter—No. 204257	General Electric Co.
1 universal armature machine—Peerless No. 48623	Electric Service Supplies Co.
1 mica shear	Electric Service Supplies Co.
1 bar bender—Segur No. 45636	Electric Service Supplies Co.
1 kinker vise	Electric Service Supplies Co.
1 wire skinner	Electric Service Supplies Co.
1 coil winder—Browning	Mutual Foundry & Machinery Co.
1 wire reel rack—Browning	Mutual Foundry & Machinery Co
1 coil spreader—30-in.	Mutual Foundry & Machinery Co.
2 coil taping machines	Electric Service Supplies Co.
1 electric bake oven	Electric Service Supplies Co.
1 dip pond	*
5 transfer trucks—3-ton	Easton Car & Construction Co.

Bearing Shop

4 babbitt pots—500 lb.	Westinghouse Electric & Mfg. Co.
1 tin pot	General Electric Co.
1 lye tank—3 ft. x 3 ft. x 4 ft.	*
1 boiler—gas fired, 5-hp.	B-Line Boiler Co.

Jacking Shop

4 cranes—20-ton, double hoist, floor-operated, 33 ft. 5½ in. span	Box Crane & Hoist Corp.

Battery Repair Shop

1 water still—gas fired, 2¾ gal.	F. J. Stokes Machine Co.
1 cap sink	*
1 battery charging outfit	Electric Products Co.

Air-Brake Shop

1 boiler—gas fired, 5-hp.	B-Line Boiler Co.
1 lye tank—3 ft. x 3 ft. x 6 ft.	*
1 two wheel grinder—14 in. x 2½ in.	Hisey-Wolf Manufacturing Co.
1 valve finishing machine—Foster	Special Bolt Corp.
1 valve testing rack	Westinghouse Traction Brake Co.
1 drill press—15-in.	W. F. & J. Barnes Co.
1 pipe threading machine—2-in.	Bignall & Keeler Machine Works
1 hoist—1-ton, monorail	Box Crane & Hoist Corp.

Pattern and Wood Shop

1 oilstone tool grinder	Oliver Machinery Co.
2 electric glue pots	Oliver Machinery Co.
1 carpenter's bench	Oliver Machinery Co.
1 patternmaker's bench	Oliver Machinery Co.
1 jointer—16-in.	Oliver Machinery Co.
1 trimming knife—No. 2.	Oliver Machinery Co.
1 patternmaker's lathe—24 in. x 16 ft.	Oliver Machinery Co.
1 band saw—36 in.	Oliver Machinery Co.
1 cut-off saw—16-in., straight line	Oliver Machinery Co.
1 variety saw—14-in., shaftless	Oliver Machinery Co.

Sheet Metal Shop

1 drill press—15-in.	W. F. & J. Barnes Co.
1 two wheel grinder—14 in. x 2½ in.	Hisey-Wolf Manufacturing Co.
1 gap punch—½-in.	Niagara Machine & Tool Works
1 bending brake—8-ft.	Dreis & Krump Manufacturing Co.
1 forming roll—8-ft.	Niagara Machine & Tool Works
1 squaring shear—8-ft.	Niagara Machine & Tool Works

General Equipment

1 transfer table—75-ton	*Box Crane & Hoist Corp.
1 freight elevator—8,000-lb., storeroom to basement	Otis Elevator Co.
1 freight elevator—8,000-lb., wheel and axle shop to motor shop	Otis Elevator Co.
1 elevating hand truck—3,500-lb.	Lewis Shepard Co.
1 storage battery lift truck—4,000-lb.	Baker-Raulang Co.
1 storage battery lift truck—2,000-lb.	Wright Hibbard I. E. T. Co.
1 storage battery crane truck—3,000-lb.	Baker-Raulang Co.
12 skid platforms—33 in. x 48 in.	Stuebing Cowan Co.
2 oil storage cabinets—6-tank, 120 gal. each, No. 64	S. F. Bowser & Co., Inc.

*Designed by the Department of City Transit, Philadelphia.

Interior of the general repair shop, showing a portion of the machine shop in the foreground and the truck repair section beyond

Trucks are fully assembled again they are returned to the jacking-up shop and placed under the car bodies. The cars then progress from this department along the east half of the building, passing from the jacking shop to the overhaul, car-washing and paint shops, in turn. The miscellaneous repair departments on this side, conveniently located to the main departments, are the battery repair shop, the electric shop, the air-brake shop, the cabinet and upholstery shops and the sheet metal shop. When completed the car is again run onto the transfer table and moved to one of the spurs leaving the building.

Shops Completely Equipped

Repairing and overhauling are simplified by the array of modern machines and tools in the various departments. A list of the more important ones is given in the table on page 468. The jacking-up shop has four 20-ton, double-hoist, floor-operated cranes, each with a span of 33 ft. 5½ in. The transfer table was specially designed for this building and is 67 ft. in length, operating in a bay with a clear span of 84 ft. The table operates on four rails and is so designed as to give a depth of pit of 19 in. that does not obstruct the movement of workmen across it. The table is designed for a live load of 150,000 lb., permitting the handling of the largest capacity freight cars in the delivery of car wheels, brake shoes and other heavy supplies.

The truck shop, which is 78x216 ft., has twelve tracks, all but one having pits. Two of these tracks are extended into the wheel and axle shop. They are intersected by a long track, extending the full length of and beyond the truck shop and are joined to it by turntables. The wheel and axle shop is equipped with a 600-ton wheel press, a 48-in. car wheel borer, a combination journal and axle lathe, an axle grinder, a wheel lathe, a 200-ton axle-straightening press and a two-wheel grinder.

The forge and arc-welding shops have a track which extends from the transfer table runway to the machine shop. The track is joined also to the long track paralleling the truck shop by a turntable. The equipment of these two shops includes three down-draft forges, a mechanical sledge, a combination punch and shear, an

East or rear section of the general repair building, with the transfer table runway in the foreground. At the left may be seen the jacking shop in the center the battery repair and electrical shops, and at the right a portion of the overhaul department

800-lb. single-frame hammer, three anvils, an air compressor system and an electrical welding outfit.

In the machine shop are found numerous lathes, drill presses and other machines. The tool room adjoining this shop has a lathe, a drill grinder and a tool grinder. The equipment is just as complete in all the other departments. The motor, armature, bearing, battery, electric, air-brake, cabinet and sheet metal shops all have the necessary machines for repairing the cars efficiently. Throughout the building a number of special machines and other equipment have been installed. Among these are a metal working machine, an armature extractor, a sand blaster, a large wheel lathe, vaporproof lamps and fireproof doors, these lamps and doors being used in the paint shop.

Ample storeroom facilities are provided on the main floor and in the basement of the L extension. The general storeroom is connected with the main floor and the basement storeroom by ramps. Individual rooms are set aside for oil and paint, and all other materials are systematically stored in numerous bins and racks. This extension also has a wood mill, a heating plant and an incinerator for burning the refuse collected from the subway stations, as well as waste materials from the shop. Several sub-storerooms are located throughout the buildings, to serve the individual departments.

The administration building has quarters for the trainmen and operating staff of the system

The shops have a number of locker rooms for the employees, all conveniently located, and in the front of the main building is a large instruction room. Ample office space also is provided in this building.

The portion of the shop to the west or front of the transfer table runway will not be expanded, partly because of the building arrangement selected and partly because the greater portion of machinery required for the maintenance of the initial equipment of cars is sufficient to care for a much larger number. However, additional capacity in the jacking shop, overhaul bay, paint room, etc., can be provided when needed by extending the main building to the east. The general repair shop can be expanded to care for more than 600 cars if necessary.

The storage building at the rear of the general repair building is intended for storing maintenance-of-way materials, primarily. It has an office and three tool rooms, and is equipped with an overhead traveling crane. The building measures 80x140 ft., and has ample room for storing the rails, special work and other materials.

Power for the Fern Rock terminal is supplied at 13,200 volts from the Louden Street substation. A 13,200-volt bus structure, located in a transformer room in the general repair shop, contains electrically-operated switching equipment for the lighting and power transformers. The lighting transformer is a 200-kva., three-phase, 13,200/550-volt unit, and feeds a lighting transfer switch on the main switchboard. Individual switches control the lighting for the various sections of the shop buildings, the entrance building, and the tower floodlights in the yard.

The lighting feeders through the shop buildings and yard are three-phase, 550-volt, and at various points single-phase, 550/250/125-volt transformers are connected to this line. The secondaries of these transformers are connected to lighting cabinets that control the lighting circuits. The intensity of the general lighting of the shop buildings is approximately 4 foot-candles.

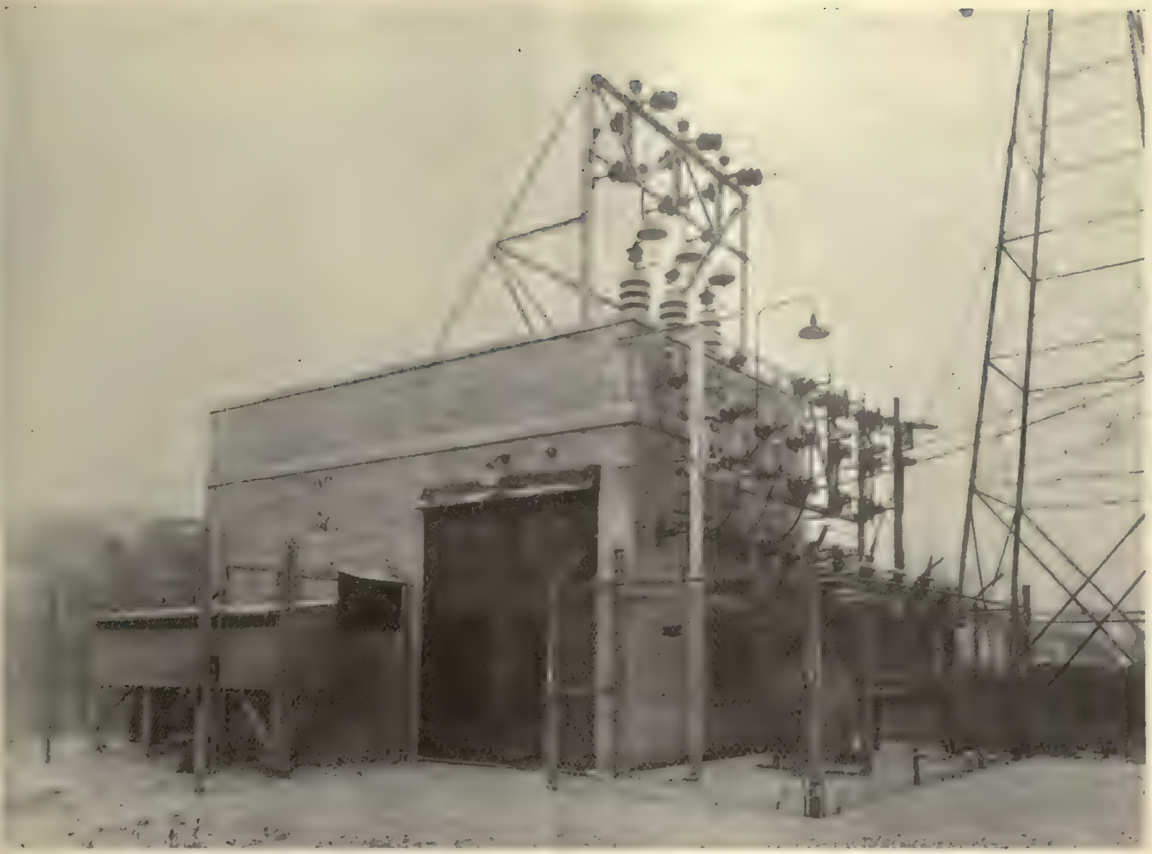
Three single-phase, 200-kva., 13,200/550-volt transformers supply the shop power. The secondaries are connected directly to the main switchboard which contains the switches and breakers for the shop and crane feeders. Two panels of this board are for 600-volt, direct-current feeders for the transfer table, and for overhead trolleys used for moving the cars in the shop buildings.

The power feeders from the main switchboard feed several large machines and cutout panels located at various places in the shop buildings for feeding the smaller machines. Each machine has the necessary compensators, controls and safety switches to safeguard the operators.

A direct-current switchboard is located in the inspection shop for the control of the overhead trolleys in that building. The total connected lighting load for the yard and shops is approximately 180 kva., and the total connected power load approximately 450 kva.

At each of the four corners of the yard is located an 80-ft. tower on which floodlights are mounted. In addition, five floodlights are mounted on the roof of the entrance building to illuminate the front of the building at night. With these four towers and the lights on the entrance building, the entire terminal is brilliantly illuminated at night, with a minimum of shadows. Thirteen 1,000-watt and fifteen 500-watt lamps are used for the floodlighting. The 550-volt feeders to the towers are connected through magnetic switches on the main switchboard, and these magnetic switches are controlled from the entrance building, making it possible to light any one of the towers from this building.

The five story administration building at the corner of Broad and Grange Streets is built on the roof of the subway, with 2½ stories below the ground level. It has a polished granite and limestone base, pearl gray semi-glaze brick walls, limestone trim and terra cotta ornamentation and cornice. The upper floors house the administrative and operating staffs of the city-built subway-elevated system. Provision has been made for the trainmen. The receiver's department for handling the receipts is in the basement, while the lower floors are used for locker rooms and small shops. For the convenience of trainmen there is an underground passage 600 ft. long on the roof of the subway connecting with the Olney Avenue station.



Exterior of Nemahbin rectifier substation, showing at left the sheet-iron housing for load-shifting resistors

Maintenance Problems with Mercury-Arc Rectifiers

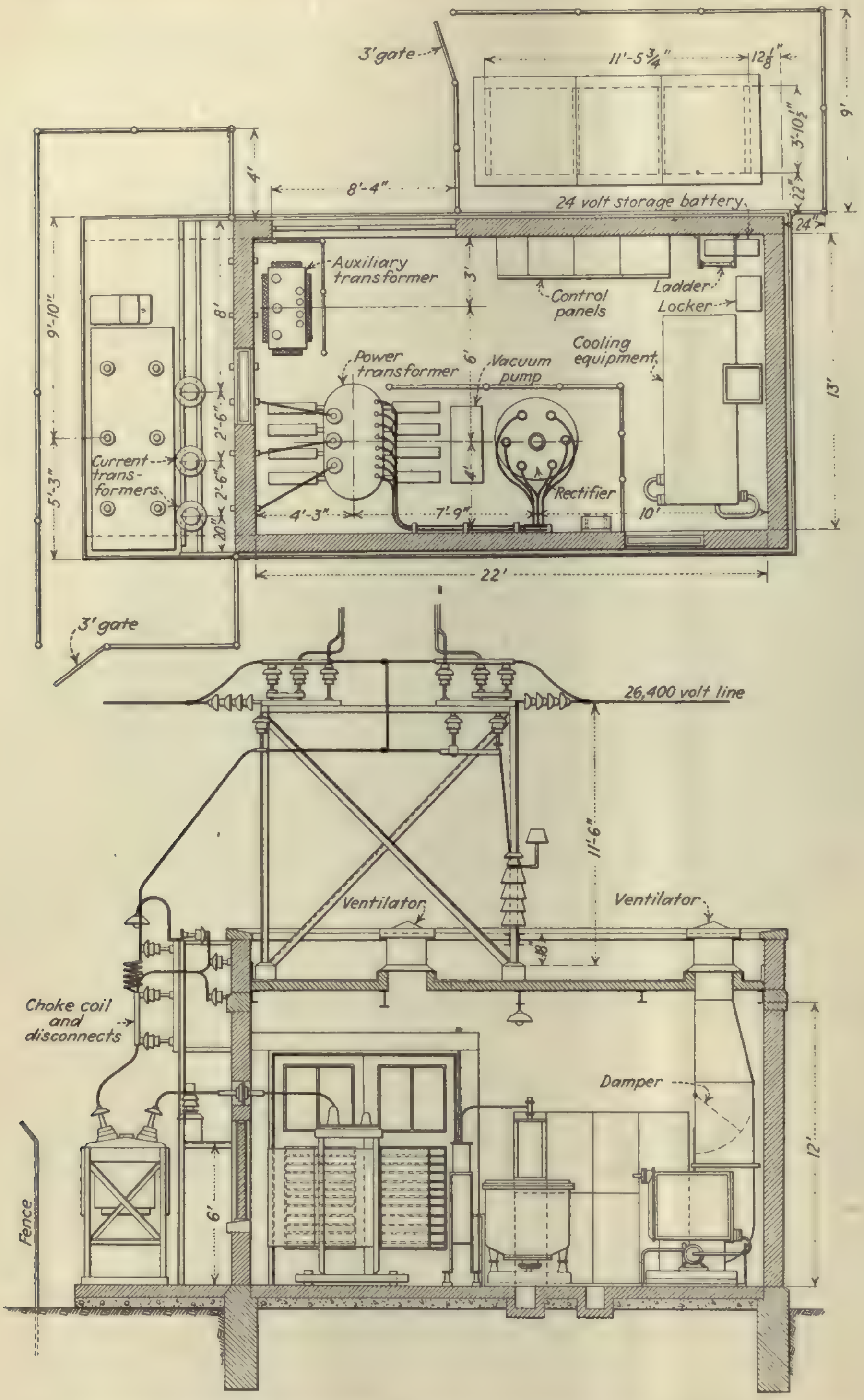
Three rectifier substations of the Milwaukee Electric Railway & Light Company are among the first fully-automatic installations for railway service in this country

By O. M. Ward

Superintendent of Operation The Milwaukee Electric Railway & Light Company
Milwaukee, Wis.

FOR APPROXIMATELY two years three fully-automatic 550-kw., 600-volt mercury-arc rectifier substations, located at Nemahbin, Oconomowoc and ipersville, have been in service on the Milwaukee-Vatertown interurban line of The Milwaukee Electric ailway & Light Company, a route which serves an imortant farming district to the northwest of Milwaukee. he substations in which they are installed are about .5 miles apart, and are all connected through 600-olt trolley feeders of the interurban line, which also are fed by manually-operated rotary-converter stations. The company also has a number of rotary-converter substations on other interurban lines which carry approximately the same peaks and deliver about the same annual output.

The original rectifier installations did not include load-limiting or load-shifting resistors. Difficulties experienced in these substations under sustained peak loads made the addition of such equipment necessary; its installation was completed late in 1927 and has materially



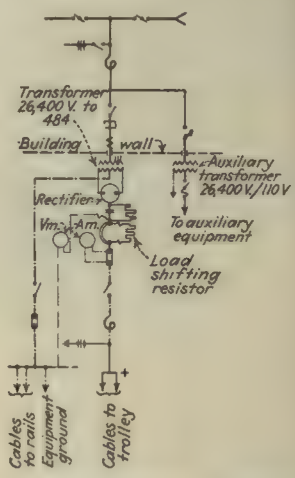
Ground plan and elevation through typical automatic substation on the Milwaukee-Watertown line, showing rectifier and auxiliary equipment

improved the operation. Without the load-limiting resistors the higher current demands put the stations off the line, resulting in very poor trolley voltage in the vicinity, with a corresponding reduction in possible train speeds. With the load-limiting resistors inserted in the feeder circuit, a station is never disconnected from the line and a fairly good trolley voltage can be maintained during high-demand periods.

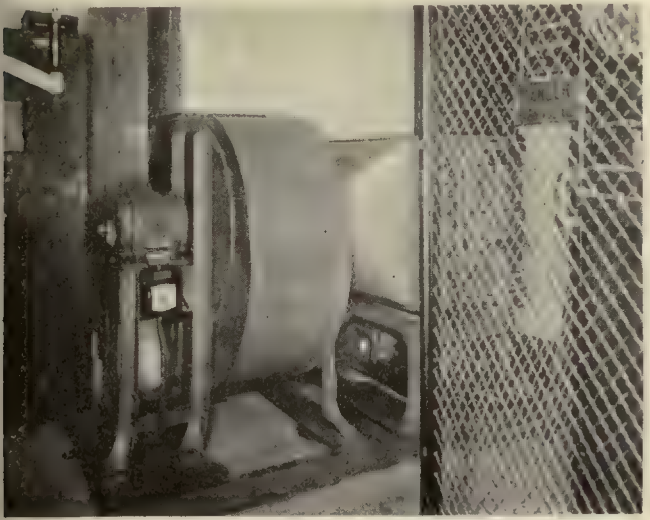
Three-car trains starting near a substation may impose a demand of 3,000 to 3,500 amp. The load-shifting resistor used is a one-step type, that is, all of the resistance is cut in or cut out at once. The resistor shunting breaker opens when the demand reaches 1,800 amp. and closes when the load decreases to approximately 1,000 amp. The resistors, located outside the substation buildings, are protected from the weather by sheet steel coverings, open at the bottom. The equipment is accessible for inspection and repairs; trouble in the resistors cannot be transferred to other station equipment, and the heat dissipated by them does not affect the temperatures of the transformer and rectifier.

WATER CIRCULATING SYSTEM USED

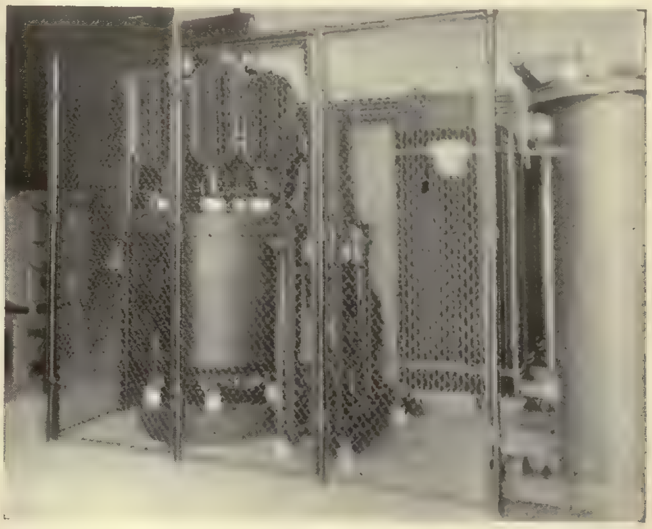
The rectifier stations have self-contained cooling systems, because no regular water supply is available. Water is circulated by a motor-driven pump through the water jacket surrounding the tube tank and through a radiator of the automotive type. The cooling system is at one end of the station. A motor-driven fan forces air drawn into the room at the opposite end past the step-down transformer and rectifier, through the radiator, and finally discharges it outside the building. A non-freeze solution of water and high-grade alcohol is used in the cooling system during the winter, the air-circulating fan being taken out of service. Fan, radiator, and pump are grounded, necessitating the use of distilled water with a non-conducting, non-freeze solution, such as alcohol, to prevent electrolytic action. Insulation of the radiator and pump has been under consideration, but it was decided that it would introduce a hazard. The equipment was arranged with the idea of keeping building size at a minimum, and there is not sufficient space to guard properly an ungrounded fan and radiator. Some difficulty has been encountered from corrosion in the water pipes and water jacket. It has been partially overcome by use of condensed water with an alkaline tendency. Caustic soda is added to distilled water to give a concentration of about five parts of sodium hydrate per million. A pH indicator (hydrogen



One-line diagram of electrical connections for 550 kw. mercury-arc rectifier units



Cooling fan, radiator and water pump are immediately adjacent to the rectifier unit in Nemahbin substation

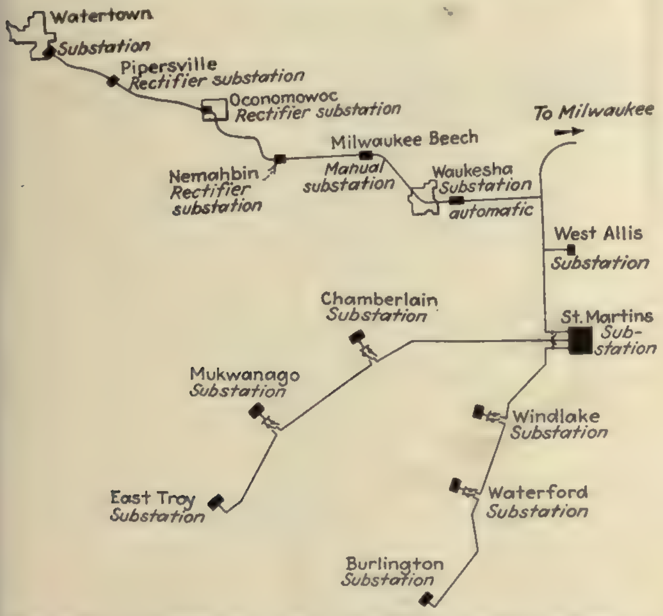


Interior of Pipersville rectifier substation. At the extreme left is a part of the self-contained water cooling system

ion concentration—being a measure of acidity or alkalinity) is used to measure the quality of the water. With the above solution a pH 9 is secured.

The water system is open to the atmosphere, admitting sufficient oxygen to cause some corrosion. Experiments are being made, using water of greater alkalinity. The water is tested and treated occasionally, but the work has not been followed up long enough yet to reach conclusions as to its effectiveness. Naturally, there is a limit to the alkalinity which can be used without materially increasing the conductivity of the water. It may be necessary to install an oxygen extraction breather on the water system opening to the atmosphere. Present experience indicates that the water jacket must be painted once a year because of the corrosion. Inasmuch as to paint the water jacket the tube tank must be raised out of the outer shell, considerable time is needed. In the future a redesign of equipment arrangement may make it possible to do work of this character without moving the rectifier off its insulators.

To prevent iron rust clogging the water pipes, a trap has been installed in the cooling system. This trap consists of a pipe tee connected in the water pipe. The tee is larger than the pipe line. To the third opening in the tee is connected a capped pipe that points downward. The velocity of the water in the tee is reduced and the suspended solids will settle into the trap. With a valve in the trap the dead-end pipe may be cleaned without disturbing the water in the cooling system.



Pipersville, Oconomowoc and Nemahbin rectifier stations are located on the Milwaukee-Watertown interurban line, while Chamberlain, Wind Lake and Waterford rotary-converter substations supply power to the East Troy and Burlington lines

Performance Better in Second Year

The record of the rectifier stations for the second year of service shows great improvement over the first year. Most of the rectifier service delays were caused by auxiliary equipment failures. These are not so serious as trouble in the rectifier, as when it becomes necessary to open the tube tank to the atmosphere, the rectifier must be out of service for quite a long time until the vacuum can be brought back to normal during the baking-out process. A distinct improvement in the rectifier operation would be made if the ignition rod spring could be done away with. This spring, as well as the contacts on the top of the ignition rod, has caused considerable trouble. To work on either necessitates the breaking of the vacuum in the tube tank.

In the rectifier installation the absence of movable parts and the quietness of operation appear to have advantages. However, the auxiliary equipment for the rectifier should be improved. If some simple method for determining the height of the mercury in the tube tank could be devised and used, this also would help materially in keeping the rectifier in continuous service.

◆

500,000 Leaflets Distributed Describing "L's" Advantages

RECENTLY the Chicago Rapid Transit Company, operating the elevated lines in the city of Chicago, made a special effort to acquaint the people living in territory adjacent to the lines with the advantages of the service and the use that can be made of it in traveling to points of interest in the city. Nearly 500,000 leaflets describing points of interest reached by the "L" were distributed in the territory a half mile on either side of the lines.

Rail Traffic 90 Per Cent, Bus 10 Per Cent in European Cities

FIGURES recently compiled, showing the relative volumes of traffic on various local transportation facilities in a number of the larger cities of Europe, indicate that the electric railways continue to carry the bulk of the load, although the bus has become increasingly popular in recent years. Except for the cities of London and Paris, where special conditions prevail, the electric railways are carrying about 90 per cent of the total traffic and the buses about 10 per cent.

In London there are about 5,226 buses operated and 2,000 street cars, and in Paris 1,371 buses and 3,183 street cars. London buses carry 40 per cent of the total number of passengers, while the street cars carried 30 per cent and the subways and the local steam railroads together about 30 per cent. For Paris the figures are respectively 40 per cent, 42 per cent and 38 per cent.

NUMBER OF BUSES AND STREET CARS IN EUROPEAN CITIES

City	Population	Number of Buses	Number of Bus Routes	Bus Route, Mileage	Street Cars Motor Cars	Street Cars Trailers
London...	7,500,000	5,226	512	1,691	2,000	...
Paris......	2,800,000	1,371	...	.....	2,291	892
Berlin.....	4,000,000	431	33	192.1	2,085	1,793
Hamburg.	1,460,000	58	13	75.6	848	867
Amsterdam	730,000	95	9	30.0	394	336
Cologne...	720,000	34 and 29 trailers	11	230.3	528	702
Rotterdam	580,000	40	7	24.9	341	146
Frankfort.	540,000	41	7	23.9	376	463
Hanover..	540,000	10	2	4.6	276	332
The Hague	490,000	30	5	14.0	275	248
Bremen...	400,000	21	4	33.3	222	244

When street car service began in London, about the time when traffic became congested the municipal government passed a law prohibiting the entrance of the cars into the downtown section, covering an area of 12.24 square miles. Only buses are permitted to operate in this part of the city. It was thought that by prohibiting the street car from entering this district the traffic congestion would be minimized, but this object has not been realized. Traffic congestion in the old downtown section of London has now reached such proportions that the condition is almost intolerable.

In Paris the area of the business section where street cars are not admitted is much smaller. The average length of a bus route here is also considerably shorter. The traffic by bus in Paris is, because of this, considerably less than in London. However, here too the effect has been the same as in London. The downtown section of Paris, where the street cars do not operate, presents the same congested appearance, and energetic efforts must be made to keep traffic moving.

Buses with three axles are prohibited from operating in the densely crowded downtown area of Paris, where it is considered that it would be impossible for them to operate safely. In this particular district the subway is looked for to bring relief. This form of transportation is being extended rapidly.

The present pressing problem of traffic congestion in London and Paris is due primarily to the tremendous increase in the number of private automobiles. The intensive use of buses in these cities also contributes somewhat to the congestion. It is now believed that the bus, due to its mingling with other vehicles and its frequent stops, retards traffic more than street cars do, particularly if the latter are used with street loading platforms such as are found in many American cities.

DISTRIBUTION OF TRAFFIC IN EUROPEAN CITIES

City	Population	Number of Passengers: Street Car	Number of Passengers: Suburban Railroad	Number of Passengers: Subways	Number of Passengers: Bus	Percentage Rail	Percentage Bus
Berlin.....	4,000,000	77,100,000	35,000,000	21,100,000	19,300,000	87.5	12.5
Cologne...	720,000	14,700,000	1,950,000	....	500,000	97.0	3.0
Leipzig....	680,000	21,700,000	400,000	....	180,000	99.2	.8
Dresden...	620,000	19,600,000	130,000	....	880,000	95.7	4.3
Breslau...	600,000	10,200,000	....	....	570,000	94.7	5.3
Frankford on Main	540,000	13,600,000	135,000	....	1,200,000	92.0	8.0
Dusseldorf	440,000	11,300,000	580,000	....	170,000	98.6	1.4
Amsterdam	730,000	122,739,337	....	....	10,656,181	92.0	8.0
Rotterdam	580,000	70,000,000	....	....	10,000,000	87.5	12.5
The Hague	490,000	63,422,011	....	....	3,404,400	95.0	5.0

In Germany bus traffic plays only a minor part as compared with the street cars. In Berlin 12.5 per cent of the total traffic is carried by bus and 87.5 per cent by rail. Elsewhere in Germany the proportion of bus traffic is even smaller.

According to *De Ingenieur,* the journal of the Royal Institute of Engineers in the Netherlands, it has been found that in Rotterdam, the main port of the Netherlands, 10,000,000 passengers are carried yearly by privately owned buses while the street cars take care of approximately 70,000,000; thus 87½ per cent travel by street car while 12½ per cent prefer, or must use, the bus. It has been estimated that in the near future, when certain extensions have been made to the rail systems, 93,000,000 passengers in that city will be carried by street cars and 9,000,000 by buses.

In Amsterdam 122,739,337 passengers were carried by street cars during the year of 1927 and 10,656,181 by buses, or 92 per cent and 8 per cent respectively. For The Hague these figures for 1927 were respectively 63,422,011 and 3,404,400, or 95 per cent were carried by street cars and 5 per cent by motor buses.

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Don't Miss the April Number
OUT NEXT WEEK

Higher Speeds Effective

in New Bedford

By Harold E. Potter

Assistant Superintendent of Transportation Union Street Railway
New Bedford, Mass.

By adjusting the schedules on several lines the Union Street Railway has made its service more attractive and at the same time materially reduced its operating costs

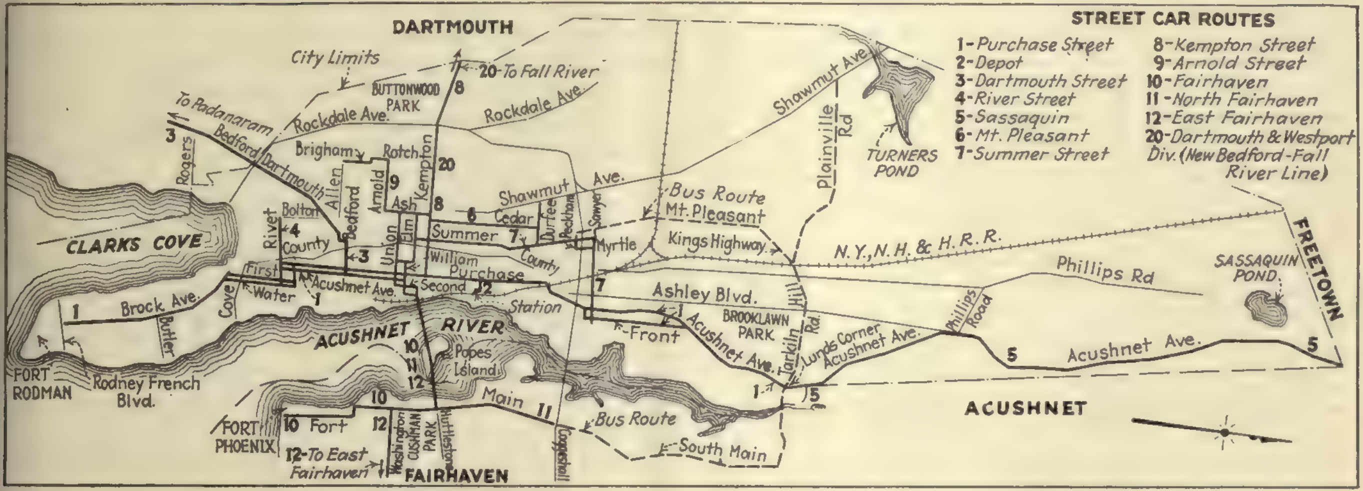

Fig. 1—Street car and bus lines of the Union Street Railway, New Bedford, Mass.

FOR a number of years the Union Street Railway, New Bedford, Mass., has maintained a traffic department which devotes the greater part of its time to analyzing riding requirements and making time-tables to meet the needs of the public. Not only has this given service where, when and as required, but it has been the means of saving the company from expending thousands of dollars in performing unnecessary service.

Recently the efforts of this department have been concentrated on the problem of increasing the schedule speeds on certain lines of the system. These increased schedule speeds have resulted in quicker transportation to the patrons, and in a number of cases operating costs have been decreased appreciably. Before placing any new schedule in operation, the traffic department makes a thorough study of the riding, first, to provide a satisfactory, speedy service to the patrons, and second, if possible, to provide more economical operation. The company realizes that while the patrons appreciate a speedier service this service is not always satisfactory unless the cars are almost certain to arrive and depart on schedule time. For this reason the company, in many instances, has followed the policy of using the slack time as layover time instead of eliminating car-hours in a way that might result in operating on an erratic headway. On the Kempton Street line, for example, ten-minute layovers are allowed in rush-hours, insuring regular service.

When the company recently changed several of its lines from two-man to one-man operation, in no instance was this higher schedule speed reduced. The operators were trained to lose no time in handling their cars and to maintain the regular schedules.

All time-tables have been so constructed that they may be adjusted readily to changes in traffic requirements without disrupting the regular basic schedules. Headway may be changed from fifteen to ten or to twenty minutes without making out entirely new time-tables. This type of schedule has been of great assistance to the supervisory force in increasing or decreasing the service as riding requirements vary. All supplementary time-tables are made out so they interlock easily with the regular weekday schedules. The trainmen are provided with pocket folders that include all the regular schedules of the system, to assist them in operating intelligently.

Before putting any important time-table change into effect the company always advertises the change for a week in all local newspapers. Thousands of cards or time-tables also are distributed to the patrons by the trainmen. An additional supply of these time-tables is always kept available for patrons. Twenty-four-hour

COMPARISON OF OLD AND NEW SCHEDULES

Route No.	Line	Schedule Speed in Miles per Hour		Round Trip Running Time in Minutes		Headway in Minutes		Number of Regular Cars Operated		Per Cent Increase in Schedule Speed	Per Cent Saving in. Cars Operated	When Schedule is Operated
		Old	New	Old	New	Old	New	Old	New			
1	Purchase Street	8.58	10.30	90	75	5	7½	17	10	20.0	41.2	Sundays and holidays.
4	Rivet Street	6.98	8.73	30	20	15	20	2	1	25.1	50.0	Sundays and holidays.
5	Sassaquin	10.96	14.25	90	40	45	45	3	1	30.0	66.6	Every day.
7	Summer Street	6.80	7.65	45	40	15	20	3	2	12.5	33.3	Sundays and after 7 p.m. every day, except Saturdays.
10	Fairhaven	7.04	7.92	45	40	15	20	3	2	12.5	33.3	
12	East Fairhaven	10.49	12.59	90	75	30	30	3	3	20.0	....	Every day.
20	D. & W. Division (New Bedford-Fall River)	13.72	16.47	120	100	30	30	4	4	20.0	....	Every day.
4–11	Rivet Street and North Fairhaven	8.22	8.22	60	60	15	20	4	3	....	25.0	After 7 p.m. every day, except Saturdays.
6– 8	Mt. Pleasant and Kempton Street	7.39	7.39	60	60	15	20	4	3	....	25.0	

switchboard service also is maintained. Patrons may telephone the company at any time during the day or night for information concerning schedules. A large chart, placed under the glass near the switchboard operator, supplies this information.

Each Line Carefully Analyzed

In the case of the Purchase Street line the riding was carefully analyzed and charted, and the number of seats furnished compared with the number occupied. The study revealed that riding on Sunday mornings was light, and the possibility of increasing this schedule speed suggested itself, since traffic congestion at that time is practically nil. A 7½-minute headway was proposed to replace the five-minute headway and a chart, reproduced as Fig. 2, prepared to show what the effect would be. As a result the new schedule was put into effect. A 20 per cent increase in schedule speed, an increase from five to 7½ minutes in headway, and a decrease in cars from seventeen to ten were some of the outstanding results of the change. The time-table was so constructed for this schedule that it can readily be linked to the regular weekday schedule at noon time. After the schedule had been in effect for a time the riding was again analyzed and adjustments made in accordance with the riding requirements. Fig. 3 shows the results of one of the checks made.

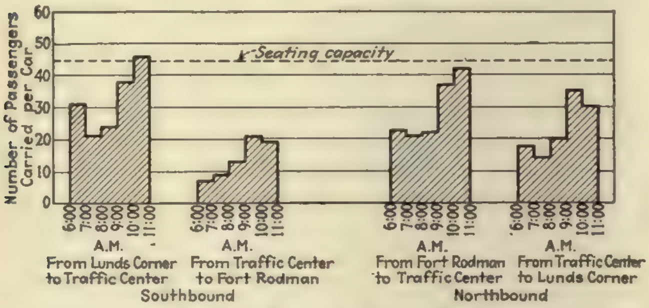

Fig. 2—Chart showing the average number of passengers that would be carried with the proposed 7½-minute headway on the Purchase Street line on Sunday mornings

On the Rivet Street line, following a similar analysis, the Sunday morning schedule speed was increased from 6.98 m.p.h. to 8.73 m.p.h., a 25 per cent increase. The headway was increased from fifteen to twenty minutes and only one car was needed for this schedule instead of two. The usual weekday schedule is maintained after noon until 7 p.m. when, except on Saturdays, the schedule again calls for 8.73 m.p.h. In addition, by joining this line with the North Fairhaven line, and having a car make one trip on Rivet Street and then one trip to North Fairhaven, it was found that the headway could be changed from fifteen to twenty minutes and the number of cars from four to three. Routings through the center of the city were not changed so that patrons board the cars at the usual places. As the schedule speed of the Rivet Street line is rather low and that of the North Fairhaven line somewhat high, this schedule has proved to be an excellent combination.

Two Other Lines Combined

After 7 p.m., except on Saturdays, the Mount Pleasant line is joined with the Kempton Street line, producing similar results. Special operator's trip sheets have been prepared so that the car operators can separate the revenue when two lines are joined together. When twenty-minute headway is in effect, the leaving times are arranged to correspond as closely as possible to those of fifteen-minute headway. For instance, on fifteen-minute headway the cars on this line leave the center of the city at 4, 19, 34 and 49 minutes past the hour, while on the twenty-minute time they leave at 5, 25 and 45 minutes past the hour. An analysis of the results of the twenty-minute headway showed no appreciable decrease in riding, which leads to the possible conclusion that the evening rider is a necessity rider.

By increasing the schedule speed of the Summer Street line from 6.80 m.p.h. to 7.65 m.p.h. on Sunday mornings and after 7 p.m. on weekdays, except Saturdays, the speed has been increased 12.5 per cent, the headway increased from fifteen to twenty minutes, and the number of cars reduced 33⅓ per cent. A notable result was an increase of 26 to 35 per cent in the number of seats occupied.

The same results were accomplished on the Fairhaven line by increasing the schedule speed from 7.04 m.p.h. to 7.92 m.p.h. on Sundays and after 7 p.m. on weekdays.

To insure a positive ten-minute leaving time of cars operated on the Kempton Street line, an additional car

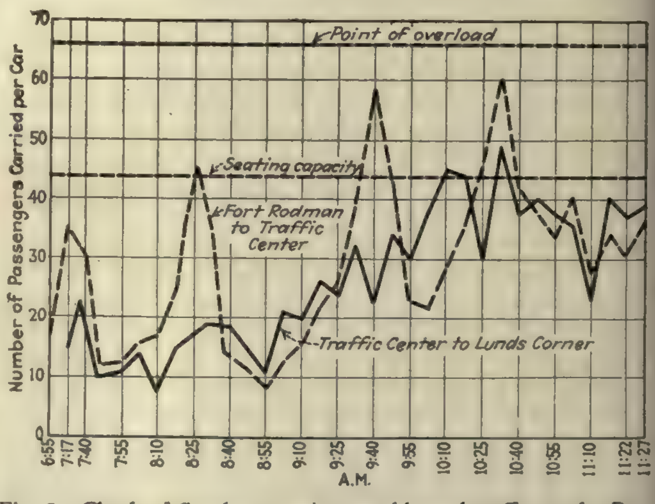

Fig. 3—Check of Sunday morning northbound traffic on the Purchase Street line with the 7½-minute headway in effect

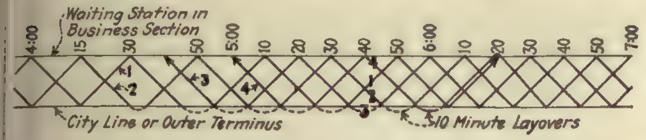

Fig. 4—Graphic time-table for the Kempton Street line during the evening rush period, showing how the ten-minute headway is guaranteed by adding a car and allowing ten-minute layovers at the city limit

has been provided during the evening rush hours, but the schedule speeds have remained unchanged. The extra time caused by operating this additional car is used at the end of the line in the form of layover time. Of course the crews do not always get this ten-minute layover time, because of traffic congestion or other delays, but this method insures a positive ten-minute headway to the public. This regular headway has eliminated overcrowding, and instead of running a single trip extra at night, which cost the company a two-hour wage guarantee to operate, this car is now operated the full two hours as shown in the accompanying graphic time-table, Fig. 4, at no additional cost to the company.

The Sassaquin line operates through a thinly populated territory at the northern end of the city to a midway point called Lunds Corner, which is 3 miles from the center of the city. Formerly, all Sassaquin cars when arriving at Lunds Corner continued to the center of the city. By so doing they operated over 3 miles of track over which the regular five-minute Purchase Street headway was being maintained. A careful survey and analysis was made of this line which showed that nearly 50 per cent of its patrons either started or terminated their rides at Lunds Corner. It also was determined that the five-minute headway on Purchase Street could easily accommodate the Sassaquin patrons riding between Lunds Corner and the center of the city. It was decided, therefore, to terminate the Sassaquin cars at Lunds Corner and to run a shuttle service between that point and the city limits.

By terminating the Sassaquin cars at Lunds Corner it was possible for the company to reduce the Sassaquin line service from three two-man cars to one one-man car, and at the same time to maintain the 45-minute headway. Only one-third of the former car-hours are operated now. The speed has been increased from 10.96 m.p.h. to 14.25 m.p.h., and the car-miles have been reduced 84,870 miles per year, a saving of approximately 42.8 per cent. The elimination of duplicate mileage alone saves approximately 127,305 kw.-hr. per year, amounting to $1,273.05.

One of the regular cars was converted, out of the savings, into a de luxe type, with heavy leather air cushion seats. The converted car, put into operation because patrons were obliged to transfer at Lunds Corner, has caused much favorable comment. A waiting station is located at the transfer point so the patrons are not greatly inconvenienced by the change. Also time-tables are issued so the passengers know when to expect a car. The entire change has saved the company several thousands of dollars and has provided a service equally as satisfactory as the former.

On the East Fairhaven line a high schedule speed could not be maintained positively because of a bus connection at the Mattapoisett terminus. However, it was increased from 10.49 m.p.h. to 12.59 m.p.h., or 20 per cent, and the running time was decreased from 45 to 35 minutes. The saving of nearly ten minutes is used as layover time at the ends of the line. In the city, a centrally located spur track is used for this layover purpose. Schedules in wooden frames have been posted on white poles located along the line to inform the patrons of the time cars are due.

INTERURBAN SPEED INCREASED 20 PER CENT

The schedule speed of the Dartmouth and Westport Division interurbans, running between New Bedford and Fall River, has been increased from 13.72 m.p.h. to 16.47 m.p.h., or 20 per cent. The running time for the round trip of 28 miles has been decreased from 120 to 100 minutes, and the slack time of twenty minutes is used as layover time in New Bedford. Because the riding of this line varies from hour to hour, and the traffic congestion in the two cities causes some delays, it was thought advisable not to try to eliminate cars operating at a higher schedule speed. The company felt that it would rather guarantee its patrons a positive leaving time, even though it was necessary to pay the trainmen when laying over. All patrons of this division are informed when the cars pass various points along the line by pocket cards. These cards are circulated by the trainmen and copies are always available. While no saving has been accomplished on this line, the quickened service has been thoroughly appreciated by the public.

While the main object of all these changes has been to increase the schedule speed of the cars on the various lines of the system, it has in many instances produced a surprising saving in car-hours, car-miles and operating costs. A summary of the changes made with the results obtained, in increased schedule speeds and cars saved, is given in an accompanying table. Although cars were reduced on several lines and headways lengthened the service has been made more attractive because of the higher speeds.

London Improves Cars to Increase Earnings

EARLY in 1925 the London United Tramways, London, England, commenced re-equipping its cars in an attempt to give a faster, more luxurious service and at the same time increase its earnings. As a test, four cars were re-equipped and placed in operation on the Shepherd's Bush-Uxbridge route. These cars proved so popular that the company rebuilt 40 cars for this service.

The two 35-hp. motors on the cars were replaced by two 50-hp. motors, resulting in an increased schedule speed from 8.5 m.p.h. to 10.5 m.p.h. or an improvement of 23.5 per cent. This speed was obtained in service calling for a possible eight stops and a usual four stops per mile. The lower decks of the cars were fitted with cross-seats in moquette (plush) and rubber flooring. The rubber flooring proved successful from the standpoint of noise reduction, but it is so difficult to keep it dry in wet weather that hardwood is likely to be used in other modernizing work.

The cost of re-equipping these cars was approximately $2,425 per car. This included new motors, line switch and cross-seats. The investment is bringing good returns inasmuch as the earnings have increased appreciably in addition to the operating gains.

In view of such results the management is planning to rebuild another 50 cars in the same way except that the car dimensions will not permit the use of cross-seats. On the allied Metropolitan Electric Tramways, 40 cars used on the Golder's Green-Finchley suburban route have been re-motored, and another 60 cars have been re-motored and equipped with new cross-seats. The South Metropolitan Electric Tramways, another allied company, has fitted sixteen cars with moquette cross-seats. One hundred cars of these companies have also been fitted with short tooth gears as a successful means of noise reduction.

In general, the management's observations are that these improvements in comfort, speed and noise reduction are having a marked effect in bringing traffic back to the railways. Today the tram is beginning to set the pace for road traffic with a schedule speed of more than 10 m.p.h., including stops. It is claimed that it will undoubtedly be able to do still better when the legal maximum running speed is raised from the present 20-m.p.h. limit.

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Illinois Association Meeting Well Attended

Co-ordination of rail and bus services, one-man car operation, mercury-arc rectifiers, and developments in new street cars share interest of delegates at two-day session

COMPETITION of the private automobile is the most significant factor affecting the success of electric railway operation today, declared J. W. Welsh, general secretary American Electric Railway Association, in addressing the opening session of the joint convention of the Illinois utility associations in Springfield on March 14. It is remarkable, however, that since 1923 the total rides on public transportation vehicles have remained practically constant at approximately 16,000,000,000 per year while the automobile registration has doubled.

Hon. Louis L. Emmerson, Governor of Illinois, addressing the convention Friday, pronounced it his belief that the powers vested in the Illinois Commerce Commission under present laws are sufficient to insure intelligent regulation. "I regard this commission," he said, "as a court which, when made up of men of the highest integrity, should function without executive suggestion or interference." Public ownership of utilities, the Governor declared, is coming rapidly; but in a way never anticipated by the early utility promoters. "It is called customer ownership and employee ownership. As the average citizen becomes more familiar with investments in securities of corporations, and as utilities see more clearly the value of customer ownership, the day will approach when most of the stockholders of your companies will be the people who use your service. When that day comes you will have found not only a new and important source of capital, but, in addition, an understanding, helpful and friendly public."

The riding tastes of the public have so changed that those in the transportation business have adopted the motor bus in increasing numbers, stated E. A. Roehry, general manager St. Louis Electric Terminal Railway, in his paper, "Co-ordination of Rail and Bus Service." "The results of experimentation with the self-propelled motor bus have been satisfactory to a considerable degree. In fact," continued Mr. Roehry, "it is no longer a question as to the advisability of co-ordinating bus service with rail operation, but rather the extent to which the motor bus should be used that is disturbing the present-day operator." After enumerating certain advantages t be derived from bus operation, Mr. Roehry hastened t add: "The bus does not offer a panacea for all trans portation ills, it has not qualified in any brilliant manne as a traffic stimulator, it is not always profitable, but does offer the advantage of developing new territory an serving where street cars could not be used.

"It is now accepted by municipal and transportatio authorities," he added, "that the agency charged wit mass transportation in any community should have contr of all methods with a co-ordinated system of street ca and bus transportation so planned and operated as t fit local conditions peculiar to each community."

During the past few years the use of mercury-a rectifiers as conversion equipment on electric railwa has increased very rapidly, and from present indicatio will probably displace the rotating machines to a gre extent, according to A. W. Baumgarten, division eng neer Chicago & Joliet Electric Railway. On his pro erty a 500-kw., full automatic, closed cooling syste rectifier has been in almost continuous operation sin that time, displacing two 250-kw., manually-operate motor-generators. The installation, according to M Baumgarten, has resulted in a saving of 13 per cent i energy, the elimination of two men and the cost of mai tenance and operation of 25 miles of transmission lin The estimated total saving is $9,576. Plans are now i progress for the substitution of a 1,000-kw., full aut matic mercury-arc rectifier for three motor-generato now in use on the system.

Late trends in street cars and equipment were di cussed by W. C. Wheeler, engineer of equipment Chica Surface Lines. Commenting on the tendency towa refinement of car design and the study of equipme possibilities indicated by the many developments carri on by railways and equipment manufacturers, M Wheeler summarized the outstanding accomplishments date. Better looking and better performing cars, whi will in turn mean faster schedules and more comforta riding, are being produced, he stated.

In his paper on one-man car operation G. W. Wels vice-president and general manager East St. Louis Rai way, said that at the present time, there are on his pro erty 39 one-man cars operating over six routes duri the rush hours. Twelve two-man tripper cars also a used during the rush hours, making the service 100 p cent one-man in the non-rush hours and 75 per cent on man at peak periods. According to Mr. Welsh, t installation of one-man service has reduced total platfo wages from 27.7 per cent to 21 per cent of the gross spite of the decline in revenue and an increase in wage

H. O. Crews, supervisor of public relations Chica Surface Lines, sketched briefly the use by his compa of motion pictures to carry to parents and children more informative picture of the operating difficulties a safety problems which confront the street railway o erator of today, and concluded with a showing of t company's latest film release, "Safe Highways."

Officers elected for the ensuing year are Charles Jones, Chicago, South Shore & South Bend Railroa Michigan City, Ind., president; G. A. Richardson, Ch cago Surface Lines, first vice-president; R. B. MacDo ald, Tri-City Railway of Illinois, Rock Island, seco vice-president; and George W. Schwaner, Springfie secretary-treasurer. The executive committee will composed of the officers and A. P. Titus, J. F. Ego and J. R. Blackhall.

Efficiency of Sand Drying Tested

Data obtained by Chicago Surface Lines on the operation of a sand-drying plant of 38,000 tons per year capacity

Sand-drying plant of the Chicago Surface lines. The wet sand storage is also shown in the background

EXTENSIVE experiments have been made by the Chicago Surface Lines to determine the efficiency of its present method of sand drying as a basis for deciding between coal and gas as fuel in its sand drying plant. The present plant is of the large coal-fired type. The hourly output of dried sand averages from 10 to 18 tons. During the past year 38,000 tons of sand were dried and a reserve supply of 34,000 tons was stored for future use. The drier consists of a revolving drum 48 in. in diameter and 14 ft. 9 in. long. At one end of this drum is a combustion chamber which has a 34x36-in. grate and is 39 in. high from the grate to the arch. The walls are constructed of 9 in. of high grade firebrick and 4 in. of common brick. In the rear of this furnace is a 30-in. diameter opening through which the products of combustion pass directly into the charging end of the drying drum. After passing through the drum they enter a stack about 40 ft. high located at the discharge end of the drum.

Air for combustion, as well as auxiliary air necessary to carry on the drying operation, is supplied by means of a 30-in. No. 6 Buffalo centrifugal cupola blower driven from the line shaft, which also drives the drum and numerous conveyors. A portion of the air supplied by this blower is delivered to the combustion chamber just under the arch, the remainder being delivered under the grate.

In operating the drier the fire is kindled each morning in the furnace by means of scrap wood and after a few minutes coal is added. After about 30 minutes of firing the furnace and drum have reached the required operating temperature. The conveyor system is then started, taking the wet sand from the supply hopper into the drum for drying. The drum is lined with fins so that when it rotates the sand is carried up its side and dropped. The heated air which is forced through the drum evaporates the moisture so that when the sand reaches the end of the drum it is dry.

The sand to be dried is stored in large piles in the yard and is taken from storage to the feed hopper by means of an electric bucket shovel. One hopperful is about the amount turned out by one shift. A normal day's operation is one shift, but there are periods when two and sometimes three shifts have had to be used to meet the demand. A normal day starts about 7:30 a.m. and ends at 4:30 p.m., but only about 7½ hours out of the nine are productive. The 1½ hours non-productive period includes a half hour for firing in the morning, a half hour lunch period and a half hour for cleaning and rekindling the fire after the noon period shutdown.

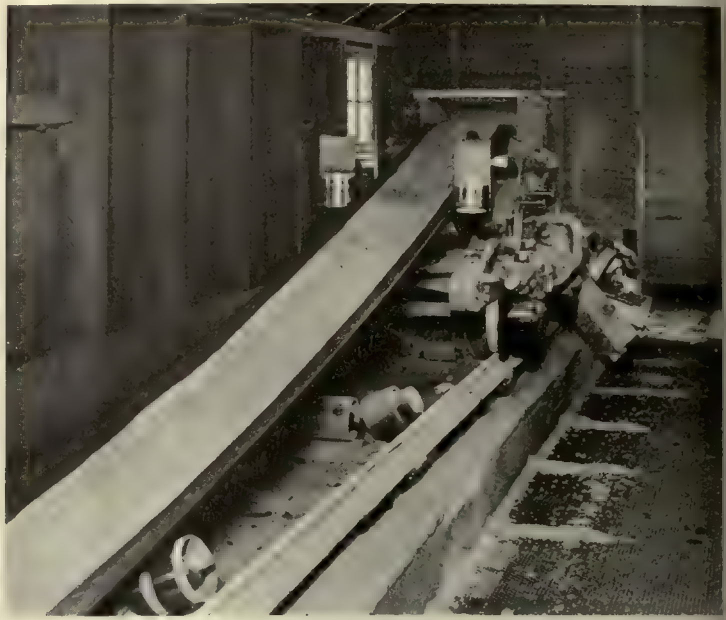
In making the efficiency test the weight of the wet sand charged into the hopper was determined by weighing it in a freight car. The total coal fired was weighed on a small platform scale. Samples were taken of each batch of coal weighed, the final cumulated sample being crushed and quartered at the end of the test. This quartered sample was then analyzed and tested.

Samples were also taken periodically of the wet and dried sand, these being analyzed for their moisture content. Half-hourly readings were taken of the temperatures of combustion leaving the drier. The carbon dioxide content of the flue gases also was taken every half hour.

The total weight of wet sand charged during the test was 127,400 lb., and the total weight of the coal fired was 1,939 lb. The moisture content by weight of the wet sand was 4.01 per cent and the moisture content by weight of the dried sand was 0.38 per cent. An 8.8 per cent carbon dioxide in the flue gases indicated that the drier operates with 139 per cent excess air.

In determining the heat output, the following computations were made. From the accompanying tables it will be seen that the sand consumed 127,400 × 0.0599 ×

The wet sand is conveyed to the rotating drum, the stack end of which is equipped with a window giving the operator a clear vision of its interior



The dried sand is conveyed to the top of the sand storage bin where it is screened after leaving the belt. It then passes into the storage bins below

(234 — 32.4) × 0.19 or 4,680,000 B.t.u. The moisture remaining in the sand accounted for 470 × (234 — 32.4) or 94,700 B.t.u. The moisture evaporated consumed 4,630 × 1,150 or 5,330,000 B.t.u. The sum of these figures gives 10,104,700 B.t.u. as a total heat output.

The total heat input equals 1,939 × 12,571 or 24,400,000 B.t.u. The efficiency of the present coal-fired system, therefore, equals the total heat output divided by the total heat input or 41.4 per cent.

To compete with coal in the matter of cost of operation

An electric crane equipped with a 1-yd. bucket loads wet sand into the 100-yd. capacity hopper

In the interior of the rotating drum the sand is carried upward by the fins and poured through the heated air which is blown through the drum by a forced draft from the firebox

it has been estimated that 30,000 cu.ft. of gas must do the work of a ton of coal. This figure allows for all of the cost incidental to coal. The foregoing figures show that by increasing the efficiency to 50 per cent, due to the elimination of the firebox and a reduction in the heating up periods, 39,000 cu.ft. of gas is required per ton of coal fired.

Under the present drying conditions it seems that gas cannot be substituted for coal at a similar cost. However, it now becomes problematical as to whether this operation cannot be carried on at lower temperatures, thus reducing the heat loss in the sand, the radiation losses from the drum, and the flue gas losses, thereby reducing the total heat requirements. By working at lower temperatures with large volumes of air, this problem becomes one of drying rather than evaporation by heat, thus presenting numerous possibilities.

TEST PROCEDURE DATA FOR FEB. 23, 1928

Time	Temperature Sand, °F. In	Temperature Sand, °F. Out	Temperature Gases, °F. Leaving Dryer	Per Cent CO_2 in Flue Gases	Remarks
9:20	..	...	...	....	Fire started
9:50	34	...	...	....	Drying started
10:00	34	220	275	6	
0:30	32	215	325	9	
1:00	32	260	310	9.5	
1:30	32	280	340	8.4	
2:00	..	...	...	....	Shut down for lunch, cleaning fires, hauling ashes.
2:30	..	...	...	....	
1:00	32	200	265	9.4	Drying started
1:30	32	225	290	9.8	
2:00	32	220	340	12.0	
2:30	32	225	260	8.0	
3:00	32	260	290	7.0	
3:15	..	...	...	....	Finished drying
Average	32.4	234	299	8.8	

COAL ANALYSIS

	Wet Basis	Dry Basis
oisture	5.10	.....
olatile matter	16.94	17.85
ixed carbon	69.52	73.25
sh	8.44	8.90
Total	100.00	100.00
.t.u. per pound of coal	12571	13247

SUMMARY OF TEST DATA

uration of test	...5 hours	55 minutes
ime of actual drying	...4 hours	25 minutes
otal weight wet sand through dryer	127,400	lb.
otal coal consumed	1,939	lb.
oisture content wet sand by weight	4.01	per cent
oisture content dried sand by weight	0.38	per cent
eight of water in wet sand	5,100	lb.
eight of water in dried sand	470	lb.
otal water evaporated	4,630	lb.
verage temperature sand to dryer	32.4	deg. F.
verage temperature sand leaving dryer	234	deg. F.
verage temperature gases leaving dryer	299	deg. F.
verage CO_2 in flue gases	8.8	per cent
and dried per production hour (wet sand)	28,900	lb.
and dried per ton of coal (wet sand)	131,500	lb.
pecific heat of sand	0.19	

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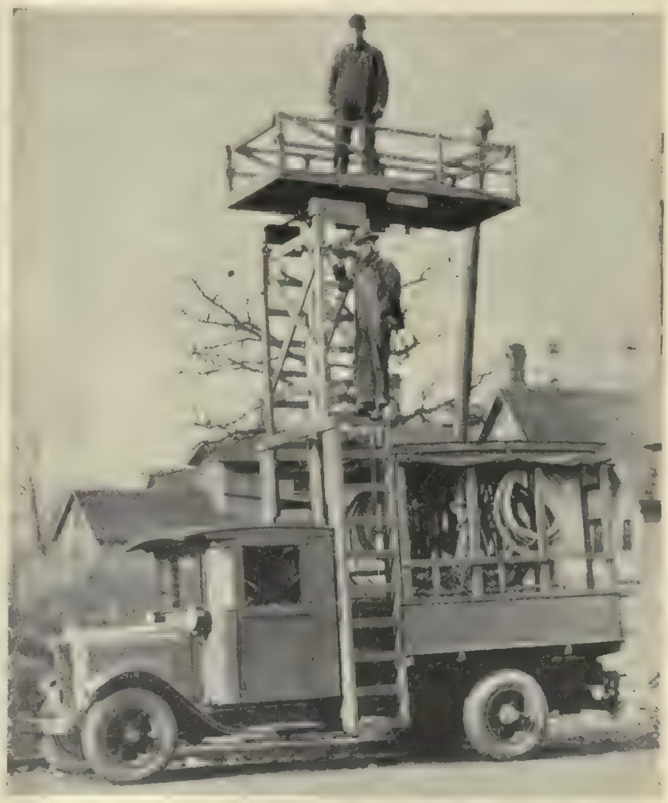
Hydraulic Tower Trucks for Twin City Rapid Transit

TWO emergency trucks with several novel features of construction and control of tower equipment have recently been added to the fleet of the Twin City Rapid Transit Company. The chassis is a 2-ton Model T-40 G.M.C. equipped with pneumatic tires. Upon this is mounted a Wood hydraulic hoist with a 4x9-ft. platform attached directly to the top of the hoist piston. The entire support for the platform is a 5-in. piston, raised and lowered by oil pumped into a cylinder by a power take-off on the transmission. A shift lever controls the raising, and another lever operating a bypass value lowers the hoist. The platform can be raised to full height in 21 seconds and completely lowered in about the same time.

The total weight of the truck, hoist and body, without any tools, material, etc., is 8,360 lb. Loaded for service, it weighs about 9,500 lb. Advantages claimed for them over older type line trucks of the company include: (1) Absence of all but a single support for the platform. This gives additional body space sufficient to accommodate six more men. As many as thirteen men can be carried, comfortably sheltered, inside the truck body—three in the driver's cab and ten on two longitudinal seats in the truck rear. (2) More tool storage space inside the truck body. (3) Shortening of wheelbase, thereby facilitating emergency parking along the street curb adjacent to the job.



The platform of this Twin City Rapid Transit tower truck is raised and lowered hydraulically by a power take-off on the transmission

Car Advertising Carried to an Extreme

COMMERCIAL advertising by car cards, as practised in this country, is a legitimate method of increasing railway receipts. Nearly always the advertisements are in good taste. Generally they are confined to a row of cards above the windows, with the occasional use of bulkhead advertising.

In Europe car and bus advertising is carried to an extreme, the announcements often being on both the inside and outside of the cars and buses. The accompanying illustrations show the interiors of a standard bus and a standard surface car in Paris. In the former it will be seen that there are two lines of car cards above the windows. The ceiling is also made to serve as display space by the advertisement of an automobile tire, painted around each electric lighting fixture. Then there are two rows of advertisements on the side panels of the bus between the seats, as well as a double row on the backs of the seats. On the seats at the extreme front of the bus which have no backs, an advertisement is carried on the woodwork just above the upholstery, as well as on the woodwork above the front windows. Finally, there are advertisements on the windows themselves. Sometimes these are of paper pasted on to the glass. Sometimes they are actually etched in the glass. Only the bulkhead space is reserved for company announcements.

The interior of the car, illustrated in the second view, shows a very similar condition except that there are no advertisements surrounding the ceiling lights. However, like the bus, there are two rows of advertising racks over the windows, though in this case one row does not seem to be filled with cards. The seats are arranged back to back, so that a whole back seat is not available for advertising purposes, but one appears on the frame of the seat back. There are also the announcements o the windows.

In some parts of Europe it is a practice to paint advertisements on the outside panels of a car, on the truck on the step risers and wherever else there seems to b vacant space.

The Readers' Forum

Asphaltum Not Advantageous for Car Floors

The Trundle Engineering Company

Cleveland, Ohio, March 11, 1929.

To the Editor:

We were much interested in the article on page 68 of the Oct. 13, 1928, issue of Electric Railwa Journal, telling of the use of asphaltum for car floor We have, during the past several years, done consid erable research work and conducted many tests an experiments on various types of car flooring material

Our conclusions are as follows:

1. Asphaltum, even when mixed with light-weigh filler ingredients, such as coke breeze, is still 20 per ce to 30 per cent heavier per given thickness than the typ of flooring now commonly used by the railroads.

2. We find that the type of composition flooring, no generally in use, has been laid $\frac{3}{8}$ in. thick on sever thousand vehicles during the past twelve years, whic are still in service.

3. Our investigations indicate that it is extremel desirable to use a car flooring material that is fireproo and one that will not melt or give off noxious fumes i case of fire.

R. C. Brett,
Research Engineer.

Cars and buses in Europe, as a rule, carry advertising to an excess. It seems to be placed everywhere that the eyes of the passengers are apt to rest

PRACTICAL IDEAS for the Maintenance Man

Spray Paint Room of Utah Light & Traction Company

AN EXTREMELY simple and satisfactory solution of the prob- m of ventilating the spray painting oom has been worked out for the tah Light & Traction Company by . W. Belcher, Salt Lake City venti- tion engineer. Since July, 1925, hen the railway adopted spray paint- g, there has been need for a method getting rid of the fumes. This as finally accomplished by installing pparatus similar to that used in nderground mines.

The new ventilation system is based oon the principle of blowing, rather ian exhausting. A sweeping action positive air currents, the railway ound, was the only thoroughly ade- uate manner of removing the dense g of paint fumes which settled close the floor. By this method, includ- g provisions for heating the air cur- nts in the winter time, a definite r change can be made in the paint oom every three to five minutes.

The equipment used is the Bayley lower Company's new "Chinook" nit heater-ventilator set No. 305. his unit is furnished in the shape of vertical cabinet, 5 ft. 6 in. long by ft. 10 in. wide, having an over-all eight of 6 ft. 4 in. Air is taken in the bottom of the casing, and scending through the casing passes rough the "Chinook" heating ele- ents, and thence to two centrifugal ans situated in the top of the casing hich discharge the air to the paint oom. The driving motor is situated one end of the casing on a bracket id is direct-connected to the fans. rough a flexible coupling. The ans are driven at a speed of 1,750 p.m. by a 5-hp., 220-volt, three- iase, 60-cycle standard constant- eed induction motor. The capacity, ased on standard air at 70 deg. F. id 29.92 in. barometer, is 9,000 i.ft. per minute.

Each fan serves a short length of)-in. diameter galvanized iron duct ading to the inner corners of the aint room. The unit itself, for con- enience and to give greater space in- de, is set up just outside one end of e paint room but inside the adjacent iop space, where clean air, partially eated, is available. The heating element in this unit is rated to heat the above capacity from an initial temperature of 60 deg. F. to approximately 100 deg. F., with hot water entering the heating coils at a temperature of 170 deg. F.

The spray room is a long, narrow compartment having a railway track in the center. A roll-type door forms the entry. Over-all length along the track is 58 ft., the width being 15 ft. 6 in. The height varies from 20 to 35 ft. The cubical content is estimated at 35,000 cu.ft. On the basis of a blower capacity of 9,000 cu.ft. per minute, theoretically there is a change of air every 2¾ minutes. Making allowance for diffusion and leakage through window frame cracks and partitions, there is an actual air change about every 3½ minutes. Paint fumes are removed almost immediately.

To get the sweeping action necessary and to control air velocity, the fresh air is introduced in two streams at one end of the long and narrow shop. Each inlet is a 20-in. diameter galvanized iron vent pipe brought in at the height of 10 ft. from the floor line at each corner of the shop. A positive air current is thus forced along each side wall and diffuses itself through the spray room, having maximum velocity at the center where the car is painted. Formation of pockets for the accumulation of fumes is also prevented.

Paint fumes and bad air find an outlet through the entry door by rolling it upward from 2 to 5 ft. The amount of door opening controls the

Blower used to force air through the paint room air velocities across the shop and the sweeping action across the floor. The venting of fumes from the floor line insures a complete removal of the heavy Duco paint spray fumes, since there is no other egress from the spray room for the 9,000 cu.ft. of air per minute being forced through the shop by the fans. In cold weather, the door can be regulated to suit weather conditions.

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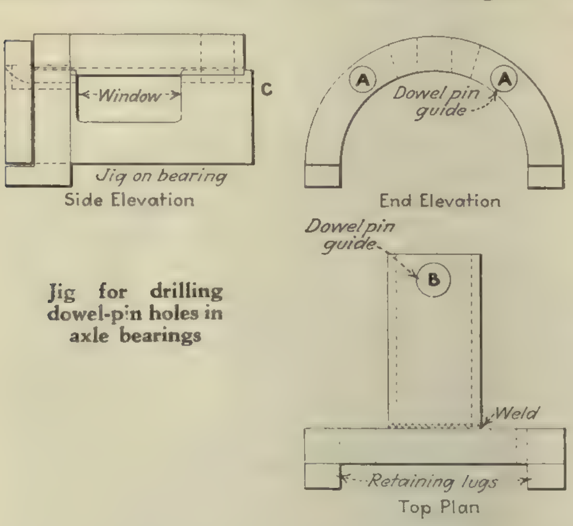
Jig Assures Accurate Drilling of Dowel Pin Holes*

By Charles Herms
General Foreman
San Diego Electric Railway,
San Diego, Cal.

HOLES for dowel pins in axle bearings must be drilled accurately and with small clearance over the size of the dowel pin. Where holes are located by center punching, or with a template, it has been found that considerable variation resulted, due to the drills crawling or to small inaccuracies in location. As a result, when the dowel pins were installed in a bearing the workmen usually cut away part of the dowel pin to fit the bearing. Wear was then rapid, and in some instances, the bearing flange was broken.



Jig for drilling dowel-pin holes in axle bearings

This difficulty has been overcome in the shops of the San Diego Electric Railway by using a jig of the form shown in the accompanying sketch. The time for drilling is decreased as the workman merely drills through the guide holes in the jig shown at A and B. The jig will slide from C to D in installation and the retaining lugs engage the bottom of the bearing flanges and hold securely to the bearing, which can be mounted on a drill press table in the usual manner.

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*Submitted in Electric Railway Journal Prize Contest.

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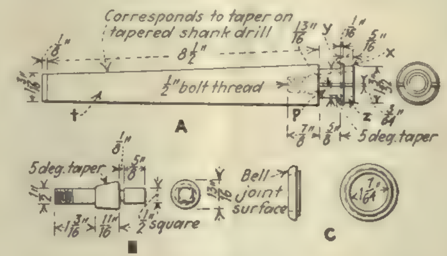
Expanding Chuck Reclaims Key Washers

EXCESSIVE wear of key washers in the ME-30 rotary valves and the impossibility of obtaining immediate shipment of this material from the manufacturers compelled the Staten Island Rapid Transit Railway, Staten Island, N. Y., to reclaim them in the shop. Before this could be done a suitable chuck had to be designed and developed.



Chuck used to reclaim key washers of rotary valves

The chuck shown in the accompanying illustration was designed and constructed by Machinist James A. Collins. It consists of two hardened steel parts, *A* and *B*. Part *A* is made from stock with a diameter of $1\frac{1}{4}$ in. The right end is turned to a diameter of $1\frac{3}{32}$ in. for a length of $\frac{5}{16}$ in. A collar $\frac{1}{16}$ in. wide with a diameter of $1\frac{3}{16}$ in. is turned adjacent. The next $\frac{5}{8}$ in. of the rod is turned to $\frac{13}{16}$ in. diameter. For the next $8\frac{1}{8}$ in. the rod is given a taper corresponding to the taper on a drill shank. This taper starts from a diameter of $1\frac{3}{16}$ in. A $\frac{1}{8}$-in. projection completes the turning process. The entire *P* and *Z* sections, and part of section *T*, are machined internally for a distance of $1\frac{3}{8}$ in. on a 5-deg. taper. The diameter of the hole at the start of the taper is $\frac{5}{8}$ in. This taper continues into a hole tapped for a $\frac{1}{2}$-in. bolt thread. Four slots $\frac{3}{64}$ in. wide are cut through sections *P* and *Z*, 90 deg. apart.

Part *B* is made from a piece of 1-in. stock. A length of $\frac{13}{16}$ in. of this rod is turned and threaded with a $\frac{1}{2}$-in. thread. The other end is provided with a $\frac{1}{2}$-in. square head, $\frac{5}{8}$ in. long, and a fillet $\frac{5}{8}$ in. wide. Between the fillet and the $\frac{1}{2}$-in. end the is given a 5-deg. taper for a dista of $\frac{11}{16}$ in. This taper starts fro diameter of $\frac{13}{16}$ in.

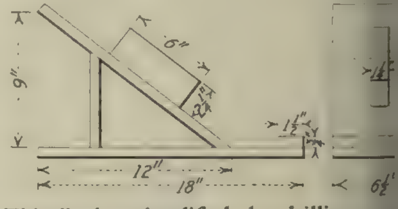
The chuck is used in the follow manner: Part *A* is placed in the la spindle and the key washer *C* instal on the surface *X* tight against collar *Y*. Plug *B* is then placed the tapered portion of *P* and *Z* screwed up until the slotted secti of *Z* expand and grip the key firmly in position. The seat is t ready for machining.

The chuck is self-centering very positive in its action.

◆

Jig For Drilling Field Terminals

DRILLING out by hand broken and burned off fi terminal screws was found to req considerable time in the shop of New York & Queens County R way, Woodside, N. Y. In order shorten this time a jig was desig and constructed so that the drill could be performed in a drill pr This is used in connection with drilling of GE-210 field coil minals. It is made of oak. The b is $1\frac{1}{8}$ in. thick, $6\frac{1}{2}$ in. wide and 18 long. The angle of the incline such as will place the terminal to drilled in the right position un the drill press spindle. In this the incline starts at 6 in. from end of the base and extends upwa until the perpendicular is 9 in. fr the end of the base. A $1\frac{1}{8}$-in. vert reinforcing strip is inserted betw the base and the incline. A block 6 long by $1\frac{1}{4}$ in. thick by $2\frac{1}{4}$ in. h is fastened to the center of the cline. The size of this block co sponds to the pole-piece hole in center of the field coil. A block $\frac{3}{4}$ high and $1\frac{1}{2}$ in. wide is faste across the end of the base 6 in. fr the end of the incline to support end of the field coil. The field the terminals to be drilled is pla on the incline over the block with bottom surface resting against $\frac{3}{4}$-in. block.



This jig has simplified the drilling pro and has decreased the time for drill thereby increasing the daily output

Helpful Equipment *from the* Manufacturers

rotective Panel for 600-Volt Motors

By E. A. Beardmore
*ndustrial Engineering Department,
General Electric Company,
Schenectady, N. Y.*

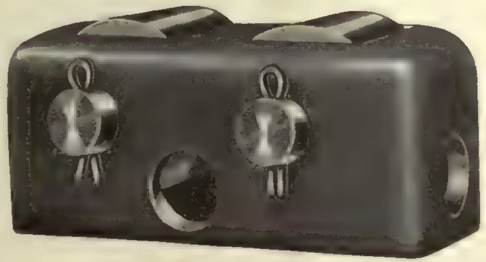
EAK-LOAD conditions of electric railway systems often sult in a considerable decrease the normal operating voltage. n 600-volt lines this sometimes reduced as low as 450 volts hen if a line breaker on a car or ain blows out the inductive kick uses a sudden increase in volt- ge. In some instances oscillo- aph tests on third rails have own inductive kicks of twice rmal voltage.

Motors operating from trolley ltage, such as are used for mps and fan motors, are sub- cted to inductive kicks and so quire some protection in order prevent flashovers. A special otective panel has been designed r use with standard starting vices in this service by the Gen- al Electric Company. On this nel are mounted a voltage relay, time delay relay, a protective re- stor, and the necessary contact- s to cut out the protective re- stor in one or more steps as the dividual application may require. When the voltage is reduced a predetermined value the voltage lay drops out and opens the contact- s, which normally short circuit the otective resistor, thus inserting it in ries with the motor to be protected. hen the inductive kick occurs the ltage relay tends to close, but the ne delay relay prevents it from clos- g before expiration of a predeter- ined time. When time delay relay erates, it allows contactors to close, tting out the protective resistor and storing normal conditions.

◆

Improvements in Side and Center Bearings

EVERAL improvements in roller side bearings and ball-bearing nter plates have been announced the White Manufacturing Com- ny, Elkhart, Ind. These include e use of chromium plating to pre- nt rust and corrosion in side bear- gs, use of heavy felt washers in th center and side bearings to exclude dirt and water and to retain grease, and an increase in the thickness of castings and the size of rollers. The hardness of the chromium-plated surface eliminates much wear. The internal rollers are held in place by pressed, fitted, and turned steel side plates. All parts are pack-hardened and heat-treated, after which they are chromium-plated. Around each side of the rollers is a heavy felt washer held in grooves which are cast in the malleable-iron housing. These washers are large and heavy enough to give long life and prevent entrance of dirt.



In this side bearing the rollers are large and the parts are chromium plated

Improved type of ball bearing center plate

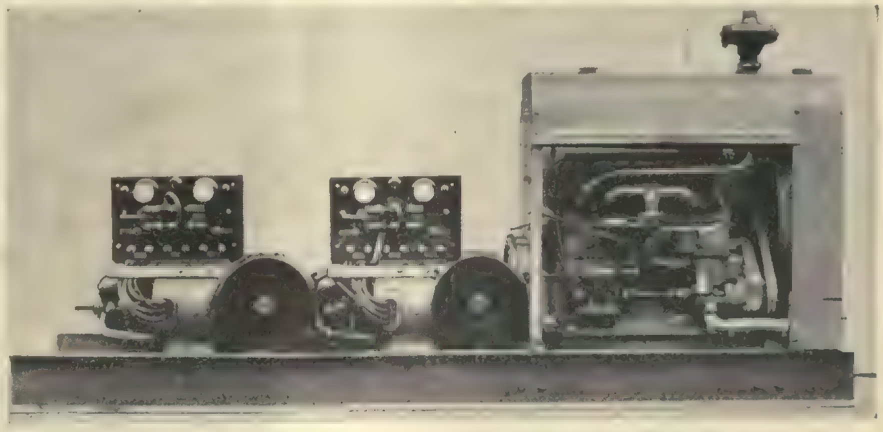
The new center plate castings have increased thickness to withstand bending strains and the thickness under the ball races is increased to withstand ball pressure. The upper plate casting is extended to form a collar down over the lower plate. Under this collar and fastened to the lower plate is a heavy felt washer.

The balls for the center-plate bearings are $2\frac{1}{8}$ in. diameter, made of drop-forged, heat-treated high-carbon chrome-molybdenum alloy steel. Each ball is extremely hard and can carry the full load of the car without showing deflection or possibility of fracture. The bearing has lower friction coefficient than a bronze plate bearing, and is superior to plain friction center plates.

◆

Two-Man Welding Outfit

A TWO-MAN welding machine motored by a single Continental 40-hp. engine is announced by the Electric Arc Cutting & Welding Company, Newark, N. J. Each of the two generators is capable of supplying 300 amp. for metallic arc-welding, and the two machines can be connected in multiple to produce full capacity for carbon arc welding. The improvement from existing equipment lies primarily in the use of separate generators, which thus can be run simply to save gas.



Two generator welding outfits driven by a single engine

News *of the* Industry

More Moves in Chicago "L" Fare Case

A new valuation of approximately $139,000,000 on the properties of the Chicago Rapid Transit Company will be ready about April 1 for submission as evidence in support of the company's suit to make its 10-cent fare permanent.

The elevated lines are seeking a permanent injunction to restrain the Illinois Commerce Commission from enforcing its order of June 28, 1928, which denied the application of the company to replace its three-for-a-quarter ticket rate with a flat 10-cent fare. The higher rate was put in effect on July 17, however, under a temporary injunction issued by the federal court.

The new valuation to be presented by Rapid Transit engineers will represent an increase of about $47,000,000 over the valuation of $92,000,000 presented by the company in the original hearings before the commerce commission in February, 1928.

Although deciding in favor of the city, which had opposed the fare increase, the commission held in its order that the company's return under the old rate was "manifestly inadequate."

Simultaneously with the announcement of a new valuation by the company's attorney, Congressman Frank R. Reid, special assistant corporation counsel, who represents the city in the present hearings, which began Sept. 18, stated that he would ask the City Council immediately for an appropriation to hire engineers and accountants to make an independent valuation of the elevated lines. The City Council has twice failed to vote an appropriation for this purpose.

In the hearings before the commission the city contended that the valuation of the Chicago Rapid Transit Lines should be only about $60,000,000.

◆

Arbitrators to Interpret New Orleans Contract

Dismissal of the injunction suit paves the way for peaceful arbitration of the dispute between members of the union and the New Orleans Public Service, Inc., over labor contracts. Union officials have announced they have selected Francis Williams, chairman Public Service Commission, as their member of the board of three arbiters. The Public Service previously announced Gustave Lemle as its selection. Messrs. Lemle and Williams are to select the third member, and if they can not agree, the chief justice of the Louisiana Supreme Court is to make the selection.

In terminating the injunction suit intended to restrain the men from putting into effect their threat to strike, Edward Rightor, attorney for the railway union officials, explained to the court that the act complained of—issuance of the suspension of work order—had been recalled and nullified, and that both sides had agreed to arbitrate their differences.

Judge Cage issued the temporary restraining order when the union officials seemed on the eve of calling a strike. He cited the union leaders to show cause why the injunction prayed for should not be issued.

The New Orleans *States* said:

> Both the corporation and its employe have shown consideration for the public agreeing to arbitrate their differenc rather than let a suspension of transport tion come about. The trouble betwe them is not a question of hours or wag It is only one of interpretation of the c tract as regards the rights of the two sid and there is no reason why this cannot determined, if not to the entire satisf tion of both, at least with less damage the corporation and its varied forces th a strike would entail.

◆

Mr. Storrs Accepts Baltimore Appointment

Managing director of the American Electric Railway Associati to start at once intensive study of problems of United Railways & Electric Company—asks forbearance

LUCIUS S. STORRS, managing director American Electric Railway Association, will become executive chairman of the board of directors of the United Railways & Electric Company, Baltimore, a position which was tendered him several weeks ago by the directors of the company. He will assume his new duties on April 1, in the meantime dividing his time between Baltimore and New York. Mr. Storrs will move his family to Baltimore and will withdraw from all other activities.

The new executive head of the Baltimore company plans to spend the next few months in an intensive study of the situation as it exists in the city. In the meantime he has requested that he be relieved from answering any questions which, although natural, should be answered only after he has had an opportunity fully to study them.

Early this year the directors of t United decided to invite Mr. Sto to become the executive chairman the board. He had the offer un consideration until March 19, when made known his decision.

Mr. Storrs' statement, in full, is follows:

> Several weeks ago, the directors of United Railways & Electric Company as me to become associated with the prope as executive chairman of the board.
>
> It was not an easy matter for me decide, for I have found an intense inter in my present duties which involve stu of all of the electric railway systems the country, their policies, managem efforts to improve service, the determi tion through experience of what was pr tical and what was theoretical.
>
> The directors and officers of the rail at Baltimore and a number of Baltim public officials have impressed upon me recent growth, development and incre of population in this territory, and desirability of working out for Baltim a future transportation system that keep pace not only with development, will look years ahead and help to prom that development.
>
> I have decided, therefore, to accept office and will take hold on April 1. that time I expect to move my family Baltimore and withdraw from all o activities, so as to be able to give undivided time and attention to the tr portation problems of that city.
>
> I was greatly impressed also by favorable condition offered by Balti as a city in which to live and work. friends connected with railroads and new industries, who have come to B more to live, have all expressed their g satisfaction and contentment with the li conditions here, the high character friendly attitude of the people.
>
> The city, with its climatic and econo advantages, presents the greatest poss ities for continued industrial expans My own experience in other cities

The First Issue of

Electric Railway Journal News

Will Be Published
April 6, 1929

News of the Industry for Busy Executives

Significant News!
Up to the Minute!
Authoritative!
Brief!

Issued every Saturday except during the weeks in which ELECTRIC RAILWAY JOURNAL MONTHLY *is published.*

shown that healthy industrial progress needs a sound and progressive transportation system. We must not only meet present conditions, but project our minds into the future.

The transportation problem is equally that of the railways and the city. Under regulated ownership, the problem becomes one of even greater import to the city and public. The company must present its problem fairly and on the basis of its knowledge and experience. The decision as to what is wise rests with public officials and the public. We must try to prevent them from making mistakes, try our hardest—for, after all, the people generally cannot study every problem. They look for honest guidance and advice from those whose duty it is to study the problem and who have made this their life work.

I shall faithfully endeavor to aid in the solution of these problems and in the development and expansion of the transportation system, and I believe that all those equally interested in the growth of the city will be willing to lend their aid and guidance free of the bias and prejudice that too often creep in among people who really have a common interest and the same purpose in view.

With this spirit of co-operation we can develop a creditable system of transportation that will be an effective agency in healthy living conditions, which are dependent upon quick and efficient transportation, and an efficient agency in the future expansion of Baltimore.

Finally, I am going to ask my new friends to give me a few months in which to study intensively the situation as a whole and in detail, and not to ask me just now questions which may seem natural, but should be answered only after full study and thought.

In the meantime my door is wide open, especially to those who are critical of the company, as I want their advice as well as that of the fine staff of men now connected with the company.

◆

Piedmont & Northern Resumes Fight on Extension

The Piedmont & Northern Railway has taken the first step toward carrying its fight to the United States Supreme Court for the right to connect its North Carolina and South Carolina divisions. Notice has been filed in the United States District Court at Greenville, S. C., of appeal from a decision of Judge Morris A. Soper, upholding refusal of the Interstate Commerce Commission to grant the road permission to build a line connecting the two divisions between Spartanburg, S. C., and Gastonia, N. C. The Piedmont & Northern, an electric line, also sought permission to extend its lines to Winston-Salem, N. C. Besides the United States of America, the notice of appeal lists the Seaboard Air Line, Atlantic Coast Line, Louisville & Nashville, Carolina, Clinchfield & Ohio of Southern Carolina, and Clinchfield & Northern of Kentucky, as opposing the link.

The Piedmont & Northern, a Duke enterprise, has been seeking permission for some time to build the Spartanburg to Gastonia link. The Interstate Commerce Commission refused permission on the ground that the proposed route would parallel the Southern Railway between Charlotte and Spartansburg.

Need for Steam Railroads to Plan Ahead

Pennsylvania Railroad to save millions in capital investment by buying energy for train operation in Eastern zones. General Atterbury declares power industry a specialized business

GENERAL W. W. ATTERBURY, president Pennsylvania Railroad, at a luncheon of the Boston Chamber of Commerce, on March 14, discussed at length the present status and the outlook of the railroads. After referring to his own company's $100,000,000 electrification program east of Harrisburg, General Atterbury said, in part:

I believe this electrification, looking a generation or so into the future development of the Eastern part of the country, is more than an ordinary expansion of railroad facilities. It is typical of the projects which business men of this country should be encouraging the railroads to undertake.

My conception of the railroad industry is fundamentally a simple one; namely, that the railroads must plan at least a decade ahead of general industrial progress to provide adequate facilities. You cannot shut down on a railroad and then tool it up for new production overnight. Business and population growth, economic changes that may affect whole industries, improvements in railroading itself, must all be anticipated; then sufficient net earnings must be available to provide the required expansion of facilities.

It must not be thought that extension of electrified railroad lines implies that the days of steam transportation are ended. On the contrary, steam power is basic to railroad operation. Special conditions of a densely populated, rapidly growing district, however, make electrical operation desirable in some instances. In other words, the new era in railroading will not supplant the old, but will supplement it.

Because of the greater volume of traffic and the greater economy of electrification as compared with steam operation in dense traffic, this electrification ultimately will pay for the very high cost of its installation.

Advantages of Electrifying Dense Traffic

This electrification will cost about $100,000,000, which is an enormous sum of money for a corporation to spend on improving its ability to serve. It is obvious that it cannot be spent at once, but must be spread over a period of seven or eight years. It is equally obvious that it should not be spent at all unless it is necessary. The directors of the Pennsylvania Railroad did not start this work until exhaustive studies had been made of the whole industrial and transportation situation in the East, including the terminal developments of Philadelphia and Newark. It was foreseen that by 1950 the metropolitan area around New York would probably extend to New Brunswick on the west and well out on Long Island on the east, and contain 30,000,000 people, besides development in other cities.

In this special traffic situation electrification became an essential development. First of all, it will result in the ability to handle much greater traffic in a shorter period of time. By the method of operation proposed we expect eventually to reduce the number of freight trains 50 per cent for a given car movement and increase the speed. This of itself provides 100 per cent increase in capacity in so far as freight movement is concerned. For passenger trains we expect to eliminate all double-heading and most of the second sections, and also to avoid the possibility of rough handling due to limited starting capacity.

Economies of Purchased Power

An interesting and significant comment upon purchased power and its value was then made by General Atterbury in response to a previous inquiry as to why the Pennslyvania had decided to take so important a step as contracting for the electrical supply for its train service in this vital area. Putting aside his prepared notes for a moment, he said:

I have been asked why we are to buy our electricity for this development. One of the best assets a railroad can have is cheap electricity available along its lines. The day of the individual industry's manufacturing its own power has passed. We worked out a jointly-owned power plant scheme with the United Gas Improvement Company and the Philadelphia Electric Company, but decided not to go into it. Why should we enter the power business? We have no warrant to go into that business, which is an industry in itself. By the time we are ready to use it we shall be buying power cheaper than we can make it ourselves, thereby saving a capital investment of from $20,000,000 to $30,000,000 over a great number of years.

It is a serious matter for me to recommend to our directors the issuance of say $100,000,000 in new capital stock. When we get that money we become trustees for it and have a solemn duty to earn and pay a reasonable return on it. We take a real risk in estimating the volume of traffic that will be available with which to earn that return, and it is vital for use to feel sure that the public, through its legislative and regulatory authorities, will permit us to earn enough to pay a fair return to our stockholders.

The next decade will see measures taken with the view of insuring every industry a fair share in the country's prosperity. It is highly important to everyone that the railroads, which have contributed so much to make prosperity possible, shall be permitted to share in it so as to continue in the vanguard of business and industrial progress.

◆

Suggestions to Picnickers on South Shore Route

The Chicago, South Shore & South Bend Railroad recently issued an attractive new folder giving hints on desirable picnic spots along its lines. It is well illustrated with halftones and reproductons of pen and ink drawings of such popular resorts as Hudson Lake, Washington Park, Michigan City, and Grand Beach, Mich. The principal appeal is made to chairmen of company picnic committees, with a view to interesting large special parties. The convenience of the South Shore Line's fast direct service and six express stops in Chicago is emphasized.

Transportation Sold from Door to Door in Roanoke

The Roanoke Railway Electric Company, Roanoke, Va., has started a system under which six employees have begun a canvass of the entire city to sell the public the idea of riding street cars and buses and also dispose of weekly passes and tokens.

Four young women and two young men were assigned certain districts in which to make a house-to-house canvass. All sections of the city will be covered by the young women, save the north east, which along with the business district, will be serviced by the young men.

Through the plan, it is hoped to bring to the housewives' attention the saving to be realized by riding the street cars and buses and furnish them tokens and weekly passes at their door, thus eliminating any confusion in making change on the buses and cars and the subsequent delays.

The canvassers will also find out how many in each home use street cars and buses, and if there is none using these services, they will seek to learn the reason.

Starting on March 20, the canvassers handled passes for the current week, the sale to continue each week through the following Tuesday night. Tokens will be sold at any time.

◆

New Fares in Vancouver

After negotiations between W. G. Murrin, president, and other officials of the British Columbia Electric Railway, and the Vancouver City Council, in connection with the renewal of franchise, the following street car fares have been agreed upon: 7 cents cash; four tickets for 25 cents; 17 tickets for $1 between the hours of 9 a.m. and 4:30 p.m. week days and all day Sundays. The city's percentage will be cut to $120,000 a year.

These conditions will be in effect for the next three years. Under the previous agreement the fares had been: 6 cents cash; six tickets for 35 cents in city area; ten tickets for 70 cents in suburban area; childrens' tickets ten for 25 cents.

Some interesting figures covering the electric railway situation in Canada were presented by the company in stating its case. In the year ended June 20, 1928, the net profits of the Vancouver city and suburban system were $233,217 on a total investment of $10,118,835, or a return of only 2.31 per cent.

In addition the company claimed that the expense of operation is increasing, and advances the following reasons: The increasing use of automobiles; increasing peak-hour traffic and decreasing non-peak-hour traffic; increasing average length of ride, owing to the spreading out of the city; higher wages to employees and traffic congestion.

The British Columbia Electric also explained that, while the population of Vancouver has increased 31 per cent since 1921, street car riding has increased only 16 per cent. The company finds it necessary to operate 46 more cars in the peak hours than it did in the corresponding hours of 1922. It has to employ 114 additional conductors and motormen, and has to pay $260,000 additional each year to cover increased wages. The traffic on long distance lines has increased but traffic on short distance lines has decreased.

The company concluded its case by stating that the problem is not only to allow an adequate fare, but to decide how to co-operate with the company so that it may continue to supply adequate transportation to the people of Vancouver. Transportation cannot be provided indefinitely by the company at a loss.

◆

Slight Damage to Alabama Railways

Recent Alabama floods damaged electric railways but little, as the heaviest floods were in southeastern Alabama where there are no electric railways. In the eastern and western sections of Birmingham a number of streets was inundated, stopping street car service for several hours. Some slight damage was done to tracks and fills. In Montgomery street cars were tied up on some streets for several hours due to high waters, and a slight financial loss was suffered. In the flood district of southeastern Alabama many state highways were flooded for several days and were badly damaged by racing waters. This has greatly retarded the bus service in the vicinity of Troy, Andalusia, Elba, Brewton and other places.

◆

Tightening Traffic Restrictions in Nashville

Several important changes in the laws governing the movement of traffic in Nashville, Tenn., affecting the central part of the city were recommended at a recent meeting of the traffic committee of the City Council. Probably the most important change proposed by the committee is that during what is known as the rush hour between 5 and 6 p.m., no automobile will be allowed to turn into Church Street from Fourth to Seventh Avenues, inclusive. According to members of the committee, this is supposed to eliminate the parade of cars that congest traffic on Church Street at that time in the afternoon, and will allow street cars to move freely.

Other revisions of the Nashville traffic code suggested by the committee were that parking be allowed on the south side of Union Street for one hour; no parking on either side of First Avenue from public square to Mulloy Street; no parking on the east side of Third Avenue from the public square south to the railroad. It also was recommended that the present speed law of the city be increased to 30 m.p.h., to conform with the state law.

Former Commissioner Suggests New Deal in Philadelphia

J. Henry Scattergood, former member of the Public Service Commission of Pennsylvania, believes reasons exist for a review of fares on the line of the Philadelphia Rapid Transit Company's expenditures, its large reserves for "maintenance and depreciation" and its policy of paying losses of some years ago out of present fares. He feels that a movement of this kind should be carried on by the municipality. It would be too big for any private individual or group to undertake. He said:

> With that in mind I told the utilities committee of the Philadelphia Chamber of Commerce that Philadelphia needs a city administration with backbone to stand up for the public interest against the traction interest, and I will add now that the people, with that thought definitely in mind, should strive to get such an administration.
>
> I believe it is desirable that justice shall be done to the Philadelphia Rapid Transit Company, as well as to the city. In this underliers-purchase plan I believe also that justice should be accorded both the city and the underliers. That is a reason I strongly favor passage of the Woodward bill and of the new measures designed to place in the hands of the Public Service Commission the power to review and, if necessary, to revise the rentals and leases between the P.R.T. and the underlying companies.

◆

Token Purchase in Sioux City to Benefit Regular Patrons

An agreement has been made between the Sioux City Service Company, Sioux City, Ia., and the City Council whereby the regular railway patron may obtain rides for 7.6 cents through purchase of $1 worth of tokens at a time. The cash fare has been raised to 10 cents, under the franchise provisions, but three tokens are sold for 25 cents and the steady patron has opportunity to ride for practically the same tariff as has prevailed in recent months. E. L. Kirk, vice-president and general manager, said that continuance of the sliding tariff depended upon customer response to the offer, but that the plan would be tested thoroughly.

◆

Vacancies on the District Utility Commission

One of the important local questions confronting President Hoover is the filling of vacancies existing and soon to exist on the Public Utilities Commission for the District of Columbia. Colonel Brand's appointment lapsed by reason of the Senate's failure to take up his confirmation. The term of Mr. Childress expires on June 30. As the Washington *Evening Star* sees it the District needs a full commission, sitting full time, to devote thought and study to the various utility questions, having in mind, it would appear, the agitation for the consolidation of the local street railways and also the imminence of the plea for changes in fares.

New Deal in Tacoma

Plan outlined under which company in Pacific Coast city will be returned to local control

ACCORDING to information received by M. G. Tennant, Mayor f Tacoma, Wash., an agreement has been reached between bondholders of both the Tacoma Railway & Power Company and the Puget Sound Electric Company with Stone & Webster, Inc., by which the Tacoma Railway & Power Company will be rehabilitated and placed under the virtually complete management of Richard T. Sullivan, present local manager.

Mayor Tennant received this information in a letter from Attorney Scott Z. Henderson, receiver for the Puget Sound Electric Company, which is the holding company for the Tacoma Railway & Power Company. Mr. Sullivan declares there will be no request for new franchises at this time, there will be no revaluations for rate-making purposes, and there is no intention either to ask a change in fares.

It will be about April 1, Mr. Sullivan states, before all the legal steps in the change of control and management can be consummated. Mr. Sullivan admits that the announcement of the change of management has been hastened over first intentions by the fact that the City Council has up for consideration the proposed agreement between the Tacoma Railway & Power Company and the city for the settlement of paving, bridge construction, track changes and other matters involved in pending public improvements and in franchise requirements.

Last December the Mayor addressed a caustic letter to Mr. Henderson calling attention to the fact that the Tacoma Railway & Power Company had not been put into a receivership as had been promised at a meeting in New York last spring between bondholders and him and threatening action to bring the matter to a head.

It was during a visit by Mr. Sullivan to the East in January that bondholders agreed to invest further substantial sums for rehabilitation of the Tacoma system. Because the plans for the reorganizations still depend, in a measure, upon the receivership of the Puget Sound Electric, details of rehabilitation, changes of personnel, revision of the system and other phases could not be made public at this time. Mr. Sullivan will move towards the substitution of bus service on the Pacific Traction line to the Lake district, on the Midland and Spanaway lines and perhaps others.

Stone & Webster, as holder through its subsidiary, the Puget Sound Power & Light Company, of $4,895,000 second-mortgage bonds of the Puget Sound Electric, might be said still to have some interest in the local properties, under the reorganization plan, but Manager Sullivan asserts that since the second-mortgage bonds are practically worthless, the concern of Stone & Webster in the matter is nominal. The Puget Sound Power & Light Company owns all the stock of the Puget Sound Electric, just as the latter owns all the stock of the Tacoma Railway & Power Company and the Pacific Traction Company.

The Puget Sound Electric under receivership has discontinued the Tacoma-Seattle interurban line, but certain properties of the Puget Sound Electric used by the Tacoma system have been reserved. These include all the yards, the Portland Avenue, the one-man and some larger cars, now under rental by the Tacoma Railway & Power Company from the Puget Sound Electric Company.

In the meantime, the City Council and Mayor Tennant, who have been discussing the problem of how leniently to deal with the railway in the matter of paving between tracks, relaying tracks, and conforming to new grades, all subjects in which the company is involved, are divided in their opinions. One group is inclined to take an uncompromising attitude, while the other appears to be disposed to allow the company several years time in which to do all the work demanded of it.

◆

Hertz Interest in St. Louis Bus Sold

The International Utilities Company, operating public utility properties in this country and Canada, has purchased from John Hertz, Chicago, Ill., for approximately $1,750,000 an interest in the People's Motorbus Company, included in the system of the St. Louis Motor Coach Company, part of whose stock in turn is held by The Omnibus Corporation, controlling lines in New York and Chicago.

Richard W. Meade, president People's Motorbus Company, declined to comment, as his company was not a direct party to the transaction.

In 1924 interests behind the reorganization of the United Railways, St. Louis, endeavored to purchase the People's Motorbus Company, but satisfactory terms of sale could not be arranged.

Lancaster Objects

PATRONS of trolley cars operated by the Conestoga Traction Company will no longer be entertained or annoyed by the merry humming or tuneful warbling of motormen.

The whole happy world for carmen collapsed on March 10, when company officials posted notices warning employees to cease further attempts at grand opera and jazz.

Railway officials said that tired office workers had complained that the whistling and humming motormen annoy them when they are homeward bound. — Philadelphia *Ledger*.

Virtual Agreement Reached on Chicago Traction Settlement

Representatives of the Chicago Surface Lines, the Chicago Rapid Transit Company and the City Council subcommittee on local transit matters have tentatively agreed on enabling legislation for consolidation of all local transportation systems in the Chicago metropolitan area.

Five legislative bills drawn by the citizens' traction settlement committee, after more than two years of futile discussions between the city and the companies, were approved in general form at a joint meeting on March 19. Facts disclosed on March 21 that company lawyers have dropped the demand that home rule be made contingent on granting of a terminable permit to which the city had objected. This was the last obstacle to the agreement on enabling bills and City Council will be asked to approve them.

The major provisions of the enabling measures are as follows:

1. Authorizing the city to grant a terminable permit and name conditions upon which it is issued, such as how it may be terminated, the rate of return to be allowed the grantee, and the number of miles of extensions and amount of new equipment to be added each year.

2. Amending the cities and villages act, restricting the term of traction franchises to twenty years, by allowing the city to grant franchises for a fixed term of years, the number to be decided by the City Council.

3. Amending the general corporation act to allow the organization of a corporation to acquire street and elevated railways, buses and other forms of local transit facilities in Chicago within a 30-mile radius of the city limits.

4. Authorizing the city to build subways and to finance them by levying special assessments against owners of property especially benefited, through use of the $50,000,000 traction fund now in the city treasury, and by means of special bonds payable out of subway earnings, or by all three methods.

5. Restoration of home rule to the city through a commission of three members who would be appointed by the Mayor, subject to approval by the City Council. The commission, having jurisdiction over all local transportation lines in the 30-mile metropolitan district, would exercise all the powers now vested in the Illinois Commerce Commission.

Upon obtaining the approval of Judge Wilkerson, under whose supervision the Chicago Railways is now being operated, the bills will be submitted to the City Council for indorsement and then presented to the General Assembly for enactment. This step would be followed by the drafting of an ordinance creating the franchise, which would be submitted to a referendum of the voters.

The settlement plan has been approved, in general, by Samuel Insull, chairman Chicago Rapid Transit Company; Henry A. Blair, receiver for the Chicago Railways; Leonard A. Busby, president Chicago City Railway; and John Hertz, chairman Chicago Motor Coach Company.

No-Accident Vacations for Gary Men

Eighty trainmen of the Gary Railways, Gary, Ind., or approximately 73 per cent of the total number employed, have operated their cars through the year 1928 without being charged with a single accident. Each honor man will receive as a reward a five-day no-accident vacation in addition to his regular annual service vacation.

Although street traffic in 1928 was probably heavier than in previous years, the number of public accidents in which Gary Railways cars and motor coaches were involved showed an actual decrease of 33.4 per cent over 1927. Each month in 1928 showed a decrease in the number of accidents over the corresponding month in 1927. Collisions between cars were reduced 53 per cent in 1928. The number of miles operated by a car without accident was 1,700 miles greater than in 1927.

Monthly safety meetings held by the company are well attended by the trainmen. At them officials talk on the subject of safety, and the operators make suggestions for the correction of unsafe practices and conditions.

Trainmen on the Gary-Hobart interurban division were the stars of the Gary Railways system last year. They had a perfect record.

◆

All Twin City Lines Included in Fare Decision

With a new rate of fare in effect in Stillwater and Bayport on the Minneapolis & St. Paul Suburban Railway, all lines of the Twin City Rapid Transit Company are affected by the recent decision of the Minnesota Railroad and Warehouse Commission giving the advanced rate of 10 cents or six tokens for 45 cents in the Twin Cities. The neutral zone between Stillwater and Bayport is out of existence and the uniform new fare is in operation. Formerly a 6-cent fare was charged in Stillwater to a neutral point, then 4 cents in Bayport.

The Suburban company petitioned the commission on Nov. 15, 1928, for an increase, but it was not effective until after the new Twin City rates had been made. The change in the Minneapolis rate affects the Lake Minnetonka line at the Minneapolis end within the city limits.

◆

Extension of Time for Electrification

The New York Senate has passed the Thayer bill, amending section 53-A of the public service commission law, stating that the time within which a railroad is to comply with the commission's order to electrify within certain city limits shall not be extended beyond seven years after Jan. 1, 1926. Previously the extension of time had been limited to five years.

COMING MEETINGS OF *Electric Railway and Allied Associations*

April 5 **— Metropolitan Section, American Electric Railway Association, 33 W. 39th Street, New York, N. Y.**

April 12 **—Maryland Utilities Association, Annual Meeting, Hotel Emerson, Baltimore, Md.**

May 1-3 **—Indiana Public Utilities Association, Indiana Gas Association and Indiana Electric Light Association, annual joint convention, Hotel Gary, Gary, Ind.**

May 13-15 **— National Highway Traffic Association, annual meeting, Stevens Hotel, Chicago, Ill.**

May 15 **—Association of Electric Railway Equipment Men, Middle Atlantic States, semi-annual meeting, Wilmington, Del.**

June 3-6 **—National Association of Purchasing Agents, Annual Convention, Hotel Statler, Buffalo, N. Y.**

June 5-7 **—Canadian Electric Railway Association, annual convention, Montreal, Quebec.**

June 21-22 **— New York Electric Railway Association, Bluff Point, N. Y.**

June 27-28 **—Central Electric Railway Association, Michigan City, Ind.**

July 24-26 **—Electric Railway Association of Equipment Men, Southern Properties, Lexington, Ky.**

Aug. 15-16 **— Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.**

Sept. 28-Oct. 4 **—American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium, Atlantic City, N. J.**

Controversy Over Counsel Fees in New York

Charles Evans Hughes was paid a fee of $75,000 for his appearance before the Supreme Court in reargument of the 5-cent fare case of the Interborough Rapid Transit Company. A statement of expense, together with others, totaling $817,000, has been filed with the New York Transit Commission by the Interborough as "operating expenses." The Interborough contends that expense of its litigation should be charged to operation. The Transit Commission, however, has served notice that fare litigation costs will not be allowed as operating charges. Other legal fees contained in the Interborough's statement of litigation expenses are: William L. Ransom, special counsel, $120,000; G. W. Wickersham, special pleader at the original Supreme Court hearing, $25,000; Harry L. Butler, counsel for the Manhattan Railway, owner of elevated lines, $55,000.

Maintenance Problems Occupy C.E.R.M.M.A.

The Central Electric Railway Master Mechanics' Association, meeting in Youngstown, Ohio, on Feb. 14, busied itself with proposed alterations in its recently published standards on uniform charges and interchange equipment maintenance, a consideration of carbon brush performance and a discussion of a prepared list of questions relating to specific maintenance practices.

"The ideal carbon brush," said J. V. Dobson, chief engineer Stackpole Carbon Company, in his paper on the proper application of carbon brushes, "must have strength, be able to withstand severe vibrations incident to road shocks, be hard, capable of resisting abrasion and dusting away. Contact drop between brush and commutator should be high, electrical resistance low and brush friction low."

In discussing the question of brushes sticking in their holders, Mr. Dobson scouted the idea that carbon actually swelled under service conditions. "It is difficult," he said, "to conceive how a carbon brush that has been subjected during manufacture to a graphitizing temperature of 3,000 deg. C., a temperature above the melting point of practically all metals, can contain anything but carbon, graphite, and a very small percentage of ash residue from iron, copper or silica. At this graphitizing temperature the brush material takes its final shape as has been verified from many tests."

"This refers, of course," continued Mr. Dobson, "only to brushes usually used in railway work, which are electrographitic and therefore baked at a very high temperature. It does not consider the so-called "doped" brushes filled with a lubricating material such as paraffin that is not baked out afterward."

Mr. Dobson pointed out that the railway motor has the advantage over strictly industrial types of doing a considerable amount of running under no-load conditions as in coasting and braking periods. This, when no power is being applied to the commutator, is very effective in cleaning and polishing it, correcting to a large extent the damage of the heavy accelerating current which may have immediately preceded. He concluded by saying that this, in a measure, was the reason why the railway motor can safely withstand greater duty both under current density and at high commutator speeds.

Following luncheon at the Poland Country Club as guests of the Pennsylvania-Ohio Power & Light Company, the association elected officers for the ensuing year. A. J. Challeen, superintendent of shops and equipment Detroit United Railway, was elected president; E. J. Jonas, superintendent of equipment Cincinnati Street Railway, was elected vice-president; L. E. Earlywine was re-elected secretary; Charles Sigler, T. H. Nicholl, J. W. Osborn, and J. B. Corderman were elected to the executive committee. The spring meeting will be held in Lima.

Recent Bus Developments

Equitable Grant Still Being Discussed in New York

Comptroller Berry, of New York City, reported to the Board of Estimate on March 18 that Edmund L. Mooney, counsel for the Equitable Coach Company, holder of the bus franchise for Manhattan, Brooklyn and Queens, had informed him on March 16 that it would be unable to proceed with the inquiry "at the present time" because all of its energies were engaged in getting a certificate of necessity and convenience. The application to the Transit Commission to reopen the hearings was made several hours after the Board of Estimate session ended. Mayor Walker suggested "that the comptroller be requested to communicate again with Mr. Mooney and find out what he means by that language—whether he means they will be ready to appear before the comptroller in a day, a week or a year."

The bus company is still a suppliant before the Transit Commission in its endeavor to perfect its rights and was notified to appear before that body on March 21 when hearings on granting a certificate of necessity and convenience were resumed. The session continued during the day and was then adjourned until March 27. The company must obtain this certificate by April 1 before it can have the right to operate buses.

◆

Illinois Senate Passes 3-Cent Gas Tax

The 3-cent gasoline tax, sponsored by Governor Louis L. Emerson in the Illinois General Assembly, passed the State Senate recently by a vote of 35 to 14. In the upper house the chief objection to the measure came from Chicago and Cook County delegations, who claimed that the state's most populous city and country would be deprived of their proper share of the revenue to be derived from the bill. As passed by the Senate, the bill contained Governor Emerson's recommendations that 2 cents of the tax should go to the state and 1 cent be returned to the county from which it was derived. The Chicagoans asked for an equal split. Amendments urged by Cook County members are expected to be discussed in the House of Representatives shortly.

◆

Amsterdam Certificate Reasonable

The Public Service Commission affirmed on March 19 its action of Oct. 18 last in granting a certificate for the operation of a bus line by Charles Vollmer over certain streets in Amsterdam, N. Y., following a rehearing had on the petition of the Fonda, Johnstown & Gloversville Railroad. This railway alleged that Mr. Vollmer was violating conditions in his certificate prohibiting carrying local passengers in Main Street and that his bus operations were affecting the income of the trolley line.

In its ruling the commission held that from the evidence at the rehearing, it was not demonstrated that the action of the commission in granting a certificate to Vollmer was in any respect unjust or unwarranted. The commission further held that the railroad, on the rehearing, was unable to show that there had been any considerable violation of the restriction against carrying local passengers and from the evidence of witnesses called by the bus operator, it appeared that Mr. Vollmer had been making every reasonable and proper effort to enforce the provisions of his certificate.

◆

City Versus State in Chicago

A rehearing of the case involving the right of the city of Chicago to require a license and otherwise regulate buses operating over its streets was asked recently in a petition filed by the Chicago Motor Coach Company in the Illinois Supreme Court at Springfield. In a decision handed down on Feb. 18, the court ruled that cities have full jurisdiction over the use of their streets by buses even though the company first obtained permission to operate from the Illinois Commerce Commission. The decision established the validity of ordinances of the city of Chicago which require such a franchise.

The coach company operates in Chicago under authority of the Illinois Commerce Commission and by permission of the local park boards. It asserts in its brief that "no prior decisions require the conclusion which this court has reached."

◆

Preliminary Steps Toward St. Joseph Installation

The St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., is awaiting permission of the Missouri Public Service Commission and the City Council to institute motor coach service on the Messanie Street line for a trial. If service by bus proves successful it is intended to substitute buses for the railway cars. The change would mean an expenditure of approximately $150,000 for new equipment, according to C. A. Semrad, general manager. The motor coach service on the Grand Avenue line has proved satisfactory and it is believed that the change on the Messanie Street line will prove popular. Because of the larger number of passengers and the greater length of the Messanie line it is planned to use larger coaches than those used on Grand Avenue.

Service Routes in Jamestown Combined

In an effort to secure more economical operation the Jamestown Motor Bus Transportation Company, subsidiary of the Jamestown Street Railway, Jamestown, N. Y., has combined its North and South Side bus routes. Another important change has been the elimination of the p.a.y.l. system in favor of the p.a.y.e. system on all lines with the exception of the one operating between Jamestown and Greenhurst, conforming to the practice of the Jamestown Street Railway.

◆

Mitten Tours Expand

Further to supplement its through motor coach service from Washington to New York via Baltimore, Wilmington and Philadelphia, Mitten Tours, intercity motor coach lines, owned by the Pennsylvania Railroad and the Philadelphia Rapid Transit Company, began hourly operation of motor coaches between Baltimore and Washington on March 15. Service from Baltimore will be every hour on the hour from 8 a.m. to 8 p.m., then 10 p.m. and 12 midnight from the Union Bus Terminal, Liberty and Redwood Streets. Service from the International Tours terminal, Washington, will be hourly from 8 a.m. to 8 p.m., then 9:30 p.m. and 12 midnight. The noon coach, however, from Washington will leave at 12:15 p.m. Running time between Baltimore and Washington is one hour and 35 minutes. Between Baltimore and Washington the one-way fare is $1.25 and round trip $2.25.

Three coaches from Washington, the 9 a.m., the 12:15 p.m. and the 9:30 p.m., will carry through passengers to New York, via Philadelphia. The schedule in Washington has been co-ordinated with the leaving and arrival times of the Richmond, Fredericksburg & Potomac Transportation Company, rendering motor coach service to Richmond and Fredericksburg, Va., and with the Greyhound-Florida lines for Jacksonville and Miami, Fla.

On Jan. 31 the Pennsylvania, following its plan of rail and motor coach co-ordination, purchased a substantial interest in the People's Rapid Transit Company, Inc., (known as Mitten Tours) and operated by the Philadelphia Rapid Transit Company. The Philadelphia transit organization still maintains an interest and it will continue to operate the service under the supervision of Mitten Management, Inc.

◆

Substitution on Eighth Avenue, New York, Urged

Eighteen civic associations asked the committees of the whole of the Board of Estimate of New York on March 18 to scrap the cars and tracks of the Eighth and Ninth Avenues Railway and to substitute a system of buses. The petition asking that such action be taken was signed by representatives of the civic associations at a luncheon on Feb. 27. The removal of the surface car lines is asked on the ground that they obstruct traffic and hinder the development of the districts through which they pass. According to the civic groups, the railway has expressed willingness to exchange its 99-year franchise for a short-term bus franchise.

Extension of Service by Pacific Electric

A certificate of public convenience and necessity has been granted by the Railroad Commission to the Pacific Electric Railway to operate motor coach service for the transportation of passengers between Wingfoot in Los Angeles, and the Ford Plant in Long Beach. This is subject to the provision that no local service be performed between Orange Avenue and Olive Street in the city of Compton, and between the intersection of Anaheim Street and Badger Avenue in the city of Long Beach, and the Ford Plant.

Meter System in Worcester by May

Possibility that the competition with which the Worcester Consolidated Street Railway, Worcester, Mass., has had to contend both on its bus and trolley lines because of a 35-cent flat fare for taxicabs may be eliminated, is seen in the recent move in Worcester, Mass., to have the taxis return to the meter system by May 1.

The license board of the city is not satisfied that the flat rate has worked out well and has given its unofficial approval to the 15 and 5-cent basis of charge rather than the old 30 and 10-cent plan in effect before meters were abolished.

The plan is opposed by taxi patrons who, by clubbing together, have been taking advantage of the flat rate much to the disadvantage of the railway.

The number of taxis has increased about 50 per cent since Oct. 1, while the number of drivers has tripled since that time. Mayor O'Hara has informed the license board that he is opposed to any further increase in numbers. On Oct. 1, the date of the introduction of the 35-cent flat-rate fare by the entry of the Ring Cab, Inc., into the field, 224 taxicabs and 423 drivers were licensed in the city. At present there are 1,146 licensed drivers and 355 licensed cabs.

Toledo High School Students Swell Bus Receipts

Special bus service operated by the Community Traction Company, Toledo, Ohio, for high school students in February carried 18,000 passengers and brought in a net profit from operation of $520. Total revenue was $1,339 and expenses $818. The revenue of 40.074 cents per mile was highest in the entire bus operations of the company.

Financial *and* Corporate

First Common Dividend by Eastern Massachusetts

On April 1 the Eastern Massachusetts Street Railway, Boston, Mass., will pay its first common dividend of the public trusteeship, which began early in 1919. The 37½-cent payment ordered by the trustees was not labeled a quarterly dividend, but the opinion of the Boston News Bureau is that in the road's strong financial condition is found basis for the belief that the stock is now on a 37½-cent quarterly basis.

After all charges and dividends on senior stock issues the Eastern Massachusetts in 1928 earned $1.55 a share on the 82,664 shares of common outstanding. This is a shade larger than common dividend requirements at a 37½-cent quarterly rate. Signs are not wanting that the new managerial régime in the Eastern Massachusetts is committed to the policy of its predecessors of going vigorously after business and low-operating ratio. If the result is to increase the net earnings the common dividend would then naturally appear to be so much more secure. The News Bureau says:

> After the maturity of $3,352,000 Lynn & Boston bonds on Dec. 1 next is out of the way, which amount incidentally will be met from treasury cash and investments the Eastern Massachusetts will have no obligations coming due until Jan. 1, 1948. This freedom from nearby maturities, combined with a strong showing as to current assets, constitutes an unusual condition of affairs for an electric railway in these times.

Circuit Court Affirms St. Louis Fare and Valuation Finding

City Counselor Muench, of St. Louis, Mo., is preparing to carry to the Supreme Court the city's fight against the straight 8-cent fare and $66,000,000 rate-base valuation, awarded the St. Louis Public Service Company by the Missouri Public Service Commission. On March 12 the Circuit Court for Cole County affirmed the commission's order in the fare case. The commission's ruling was handed down on June 21, 1928, and the 8-cent fare went into effect on July 1, 1928.

Of the $66,000,000 value placed on the property the commission decided $63,500,000 represented tangibles used or useable for service. The values are as of Jan. 1, 1927. This valuation is an increase of $14,000,000 over a tentative value of $52,000,000 fixed by the commission in June, 1927, when the company was granted a temporary fare increase from 7 cents to 8 cents, with two tokens for 15 cents, pending a final order.

In its appeal to the Supreme Court the city will contend that the commission did not give proper consideration to investment cost but based its ruling on the theory of reproduction new less depreciation.

The company sought confirmation of a valuation of $75,000,000 with an allowed return of 8 per cent on that value and a depreciation allowance of $1,500,000 a year. The commission fixed the return of 7.14 per cent and cut the depreciation allowance to $800,000 a year.

In sustaining the commission, Circuit Judge Westhues merely announced his ruling with an entry of affirmation on the court docket.

Foreclosure Sale at Binghamton May 15

The properties of the Binghamton Railway, Binghamton, N. Y., will be offered for sale on May 15 in mortgage foreclosure proceedings, with initial bids to be at a set-up price of $2,300,000, as ordered by the federal court. The sale will include the lighting plant and franchise in Endicott, N. Y., a tract of more than 50 acres in the center of Binghamton and other holdings.

W. S. Appleyard Buys Railway at Burlington, Vt.

William S. Appleyard, who for the past three years has been operating the Burlington Rapid Transit Company running bus lines at Burlington, Vt., has bought from the People's Light & Power Corporation, New York, all the stock of the Burlington Traction Company, which in 1926 was valued by a Stone & Webster appraisal engineer at $1,231,500. The Burlington Traction Company includes the Military Post Street Railway, operating between Burlington and Essex Junction, 8 miles, including a stop at Fort Ethan Allen. Other than the electric railway operating between the villages of Stowe and Waterbury the Burlington Traction is the last city system of its kind in the state.

Extension of Time for Deposit of Brooklyn City Stock

The committee for stockholders of the Brooklyn City Railroad, Brooklyn, N.Y., under plan and agreement of Feb. 13, 1929, has announced extension of the time, up to and including April 1, 1929, at 3 p.m., within which deposit of stock may be made. The Brooklyn Trust Company is the depositary of the stock. The stock is being deposited under the plan for the consolidation of the property with the street surface lines of the Brooklyn-Manhattan Transit Corporation. The terms under which the roads will be brought together were outlined in the ELECTRIC RAILWAY JOURNAL for Feb. 16, page 301.

Massachusetts Route Discontinued

The Massachusetts Northeastern Street Railway ceased operations at midnight on March 17 on its line between Lawrence, Mass., and Salem, N. H. Service by railway in the town was at one time supplied by the line from Haverhill, Mass., which operated to Canobie Lake Park, connecting Salem with Salem Depot. Another line operated via Salem Depot to Hampshire Roads, Lawrence and Methuen, Mass. A month back no cars were operated beyond the Massachusetts line but the Massachusetts Northeastern took over the route between Lawrence and Salem and had cars connect with the Hampshire road.

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Hudson Valley Properties Sold

Sale of all the properties of the defunct Hudson Valley Railway, extending from Warrensburg to Troy, N. Y., was announced on March 16 by the Delaware & Hudson Railroad, owners of the company. Included in the transactions were tracks, wires, rights-of-way, substations, the waiting room in Saratoga Springs and other real estate in Saratoga and Ballston Spa. The property was disposed of to eighteen persons and companies. Figures for the deal could not be learned.

The announcement set at rest rumors that the Delaware & Hudson was planning to build a new line between Mechanicsville and Fort Edward, since the rights-of-way of that area were included in the disposal.

Large purchasers of the various properties were the New York Power & Light Corporation, the Eaton Wrecking Company, Albany, the Schenectady Railway, the Boston & Maine Railroad, the Hudson Transportation Company, the United Paper Board Company, of Thompson, and B. M. Frank, New York.

◆

Short Brooklyn Three-Cent Line Succumbs

Final action has been taken by the Board of Estimate in acceptance of the $206,000 selling proposition of the Manhattan Bridge Three-cent Line. This marks the end of an adventure in transportation begun in 1912 by a combination of Brooklyn business men to connect the junction of Fulton Street and Flatbush Avenue with the east side of Manhattan by a short line, using the Flatbush Avenue extension and the Manhattan Bridge. The price the city is to pay includes the whole plant and equipment. It also includes a franchise running to 1937.

For years the road did a fairly good business, with sixteen cars and 5 miles of track. Power was purchased, but there came accidents on which heavy damages were assessed against the line.

The city plans to convert the space on the bridge now occupied by the trolley tracks into two additional lanes for automobiles and to arrange for a bus service to supplant the former service by trolley.

Conspectus of Indexes for March, 1929

Compiled for Publication in Electric Railway Journal by

ALBERT S. RICHEY
Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last 5 Years	
				High	Low
Street Railway Fares* 1913 = 4.84	March 1929 **7.75**	Feb. 1929 **7.75**	March 1928 **7.61**	Feb. 1929 **7.75**	Jan. 1924 **6.91**
Electric Railway Materials* 1913 = 100	March 1929 **144.8**	Feb. 1929 **145.0**	March 1928 **140.1**	March 1924 **163.9**	Feb. 1928 **139.5**
Electric Railway Wages* 1913 = 100	March 1929 **230.1**	Feb. 1929 **229.9**	March 1928 **228.8**	March 1929 **230.1**	Jan. 1924 **217.4**
Am. Elec. Ry. Assn. Construction Cost (Elec. Ry.) 1913 = 100	March 1929 **203.4**	Feb. 1929 **205.2**	March 1928 **200.5**	March 1924 **206.8**	Sept. 1927 **199.4**
Eng. News-Record Construction Cost (General) 1913 = 100	March 1929 **207.8**	Feb. 1929 **210.4**	March 1928 **204.6**	March 1924 **224.7**	Nov. 1927 **202.0**
U.S. Bur. Lab. Stat. Wholesale Commodities 1926 = 100	Feb. 1929 **96.7**	Jan. 1929 **97.2**	Feb. 1928 **96.4**	Nov. 1925 **104.5**	April 1927 **93.7**
Bradstreet Wholesale Commodities 1913 = 9.21	March 1929 **13.00**	Feb. 1929 **12.98**	March 1928 **13.34**	Dec. 1925 **14.41**	July 1924 **12.23**
U. S. Bur. Lab. Stat. Retail Food 1913 = 100	Feb. 1929 **154.4**	Jan. 1929 **154.6**	Feb. 1928 **151.6**	Nov. 1925 **167.1**	May 1924 **141.0**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Feb. 1929 **161.0**	Jan. 1929 **160.9**	Feb. 1928 **161.5**	Nov. 1925 **171.8**	April 1928 **160.8**
Industrial Activity Elec. World—Kw.-hr used 1923-25 = 100	Feb. 1929 **140.4**	Jan. 1929 **132.5**	Feb. 1928 **127.7**	Feb. 1929 **140.4**	July 1924 **73.4**
Bank Clearings Outside N. Y. City 1926 = 100	Feb. 1929 **110.1**	Jan. 1929 **108.7**	Feb. 1928 **99.0**	Feb. 1929 **110.1**	May 1924 **84.4**
Business Failures Number Liabilities (Millions)	Feb. 1929 1720 **62.26**	Jan. 1929 2184 **56.19**	Feb. 1928 1882 **51.30**	Jan. 1924 2231 **122.95**	Sept. 1928 1348 **23.13**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Disputes Nashville Valuation

The Nashville Railway & Light Company, Nashville, Tenn., has entered exception to the order of the Tennessee Railroad and Public Utilities Commission of Dec. 22, 1928, in which the commission fixed the valuation of the properties of the company. The formal protest and exception was filed by Attorneys W. E. Norvell and J. M. Anderson, and says that the value as determined by the commission "is grossly inadequate and insufficient and is substantially less than the valuation to which the company is entitled under a correct and proper application of well-settled principles of law to the facts as they appear in the record."

As mentioned in the Electric Railway Journal, issue of Jan. 26, a $17,500,000 value was placed on the Nashville property.

◆

Service to Be Restored on Rockaway Road

Plans are in the making by H. E. Salzberg Company, Inc., New York, for the early restoration of service by the Ocean Electric Railway, purchased recently. It is intended to operate service by electric railway from Hammels to Neponsit over the streets of these and intervening towns. To this end a new company is being organized. A survey of the traffic possibilities has already been made and the intention of the purchasers is to put on new cars. The road runs the length of the Rockaway Peninsula, a territory very heavily populated particularly during the summer months, and the feeling of the new owners is that under rehabilitation the road can be made profitable. An indiscriminate service by bus is now being given in the territory, but this has been so unsatisfactory that the new owners have received the pledge of support of the business interests. The physical changes in the property are to be carried out so that the road will be in condition properly to handle the expected seasonal patronage.

◆

Auburn & Syracuse to Abandon

Operation of the Auburn & Syracuse Railroad will be abandoned within the next two months. The bondholders protective committee has decided that it would not be advisable to bid in the property at a sale to be ordered by the court. An asset of real value is Owasco Lake Park, near Auburn, N. Y., leased to others during the last few years. Operation of the trolley line has brought successive losses.

T. C. Cherry was appointed receiver for the railway two years ago when the road defaulted in payment of interest on its first mortgage bonds. Last August Rolland B. Marvin was appointed referee to compute the amount due on the mortgage.

Alexander H. Cowie, the receiver, and attorney for the bondholder protective committee, will apply soon for the sale of the property to the highest bidder.

The decision of the committee in this case is expected to result in the property going to some bidder who will operate the park at Owasco Lake and junk the tracks and equipment. Auburn city lines owned by the company were junked sometime ago and a bus corporation is operating in that city.

Interests identified with the railway also organized the Mid-State Coach Lines, which is operating buses between Syracuse and Ithaca by way of Auburn.

The railway extends from Syracuse through Taunton, Spit Rock, Marcellus and Skaneateles to Auburn. There is no bus service now from Syracuse to Marcellus or Skaneateles, but it is understood the Mid-State company is planning to move soon for permission to extend its network to include these places.

Boston January Receipts $74,244 in Excess of Cost

Trustees of the Boston Elevated Railway, Boston, Mass., report for January a revenue of $74,244 in excess of cost of service compared with similar excess in January, 1928, of $191,382.

For the seven months of the trustees' fiscal year ending Jan. 31, 1929, cost of service exceeded revenue by $629,520 compared with a similar excess of $323,417 in the preceding year.

The road carried 32,038,239 revenue passengers in January of this year compared with 33,164,520 in the corresponding month a year ago. Average fare per revenue passenger decreased from 9.262 cents to 9.255 cents.

A greater amount of service was provided, however, for the smaller number of passengers. Trips operated increased from 633,881 to 654,205 and total miles operated increased from 5,013,084 to 5,107,130.

Hears Argument on Illinois Abandonment

Hearings on an application of the Chicago & Illinois Valley Railroad for authority to discontinue service and remove the tracks over that portion of its line between DePue and Princeton, Ill., were begun in Chicago recently before the Illinois Commerce Commission. In seeking permission to abandon this 14-mile section of its interurban system, the railroad presented evidence showing that operations were being carried on at a steadily increasing loss.

$11,556 Balance on Utah Commission Report

The annual report of the Public Utilities Commission of Utah, for the year 1928, shows appropriations, allowances and receipts for the year of $35,819, which included a balance from the report for the year ended on Jan. 1, 1928, of $10,617. Expenditures were $24,263, leaving a balance on hand of $11,556.

Real Progress Noted in Toledo in 1928

Surplus earnings of $125,150 credited to the stabilizing reserve after all operating expenses, taxes, and charges, compared with a deficit of $361,825 for the previous year, tells the story of 1928 or the "year of greatest progress and achievement so far as public transportation in Toledo is concerned." This was revealed in the annual report of Commissioner E. L. Graumlich submitted to the City Council. Operations of the Community Traction Company show the marked benefits of a co-ordinated railway-bus operation, improvement in railway equipment, new bus equipment, economical and centralized storage of buses, elimination of competition, and the general benefits of good industrial conditions in the city.

During the year the transportation ordinance passed by the City Council with approval of Mayor W. T. Jackson, the Street Railway Board of Control, and company representatives of Henry L. Doherty & Company provided a lower power rate, a refund of $150,000 on power charges, a definite paving and repaving program for the next five years, payment of old paving obligations to the city, establishment of crosstown bus service, reduction in bus fares, restoration of control of service to the city and elimination of bus competition.

Passenger revenue for 1928 was $3,479,628 compared with $3,251,198 for the previous year. There were 48,230,315 revenue passengers compared with 45,503,270 in 1927. Increase in patronage came largely from extensions of service to parts of the city not served before. Increases in revenue were also obtained from special services, subsidies and the rent of tracks and terminals for interurban use. Total revenue from all sources was $3,691,071, an increase of $259,288 over the previous year.

In the face of an increase of 10 per cent in service, operating costs were reduced from $2,044,191 in 1927 to $2,018,119 in 1928. While wage costs went up due to increased service, cost of power was cut about $30,000 and settlement of injury and damage claims reduced about $50,000 through continuous safety campaign and careful handling of claim cases. Taxes were $230,356, a considerable increase. This sum was almost equivalent to half the amount paid in bond interest and preferred stock dividends.

Bus operation provided total revenue of $495,633 which is 118 per cent gain over the previous year. Revenue passengers on coaches increased from 2,795,052 in 1927 to 6,150,851 in 1928. Net income from the coach operation was $50,065 against a deficit of $15,457 the previous year.

INCOME STATEMENT OF THE COMMUNITY TRACTION COMPANY FOR YEAR ENDED DEC. 31

	1928	1927
Passenger revenue	$3,479,628	$3,251,198
The fares collected from street car and coach passengers.		
Special revenue	42,526	36,176
The revenue derived from cars and coaches used for special services and from subsidies.		
Express revenue	274	491
Collected for carrying newspapers on the cars and coaches.		
Station and car privileges	33,417	32,305
Paid to the company for advertising cards on the cars and coaches.		
Rent of equipment	3,455	6,220
Received from other companies for the use of company cars (Point Place).		
Rent of tracks and terminals	110,748	81,512
Paid to the company by interurban lines for use of city tracks.		
Rent of buildings and property	287	481
Received for the use of land or buildings—bill board space.		
Non-operating income	20,734	23,396
All revenues which are not the result from operation—interest earned on the several funds, cash discounts.		
Total revenue from all sources	$3,691,071	$3,431,783

OPERATING EXPENSE AND DEDUCTIONS FROM INCOME OF COMMUNITY TRACTION COMPANY

	1928	1927
The Milner ordinance directs that the revenues of the company shall be used as follows:		
Operating expense	$2,018,119	$2,044,191
This is the cost of operating the cars and coaches—conductor and motormen wages, cost of power, injury and damages, and gasoline.		
Maintenance	547,044	570,992
The amount provided for repair of tracks, cars and coaches.		
Taxes	230,356	209,524
Real and personal tax, state excise tax, public utilities, automobile license, gasoline tax	0	0
Total operating expense and taxes	$2,795,521	$2,824,708
Income from operation	$895,549	$607,074
DEDUCTIONS FROM INCOME		
Depreciation	199,323	139,888
The amount set aside for renewals and reconstruction.		
Sinking fund—(city's purchase fund)	72,603	317,323
2½ per cent of capital value must be set aside out of operating revenues for the purchase and retirement of bonds and preferred stock for which common stock is issued to the city.		
Interest—unfunded debt	50,002	31,306
Interest on money borrowed for current needs, coach contracts	0	0
Total deductions from income	$321,929	$488,518
Balance is available for:		
Stabilizing reserve	$573,620	$118,555
Ordinance requires that from this fund shall be paid:		
Interest on bonds	375,515	392,665
Dividends on preferred stock	87,955	87,715
Total interest and dividends	$463,470	$480,380
Net increase deficit	$110,150	$361,825
Add—refund on power—ordinance No. 6480	15,000	......
	$125,150	

Personal Items

C. H. Jones Heads Illinois Association

C. H. Jones, general manager Chicago, South Shore & South Bend Railroad, South Bend, Ind., was elected president of the railways group at the recent joint sessions of the three organizations, namely, the Illinois Gas Association, the Illinois State Electric Association and the Illinois Electric Railways Association. In this capacity he succeeds R. F. Palmblade.

Mr. Jones' name has long been identified with accomplishment in the electrical field. Since his affiliation with the Chicago Rapid Transit Company in 1909 he has given unstintingly of his time and effort to electrical development. He was made electrical engineer of the Chicago Rapid Transit Lines and the North Shore Line in 1917. Prior to this he had made a reputation for himself in the rebuilding of the power distribution system of the Rapid Transit Lines and he was to add to his record later in the work on the new Skokie Valley Route of the North Shore Line. The expeditious handling of the thousands who visited Chicago during the Eucharistic Congress in 1926 was attributable in great measure to his leadership.

C. H. Jones

Of his latter-day accomplishments is the high standard of service maintained on the South Shore Line and mentioned in these pages under date of Aug. 21, 1926, at the time of his assuming the duties of general manager of the company. In this capacity he succeeded Charles W. Chase. At that time the company's operating headquarters were removed from Gary to Michigan City, Ind. Since the purchase of the insolvent Shore system by the Insull interests in 1925, the company has been domiciled in Gary.

Mr. Jones was born in Chicago. He was graduated from Armour Institute of Technology in 1909 with the degree of electrical engineer. Mr. Jones has always been interested in association activity, particularly the work of the body of which he has now been made the head.

◆

F. W. Hoover in Industrial Survey Work

Fred W. Hoover, former vice-president Consumers Power Company and later associated with Hodenpyl, Hardy & Company, Inc., has established department headquarters at Jackson, Mich., in charge of the Allied Power & Light Corporation's newly formed industrial development department to co-operate with and supplement activities of commercial organizations operating in the various local communities served by companies with which Allied Power & Light is identified. Work of this character has been carried on for several years by various operating companies, but the new department not only will consolidate the activities of such companies but will provide a clearing house and will make available engineering and economic advice and data to each community expert for directing industrial promotion efforts.

Within the territory served by the operating companies, Mr. Hoover believes the organization can do a lot of effective preliminary work, and supply the local chambers with a mass of valuable data and information which will be helpful in guiding and confining their activities and enthusiasm to channels which promise the greatest degree of permanent, constructive benefit to their communities. Primarily the work will be of an advisory nature, but, in the last analysis, it will have to be the Chamber of Commerce or some other local industrial development agency which brings the new industry into the community and gets the credit for the accomplishment.

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Changes in St. Louis

G. Z. Ledford is now temporary superintendent of car operation for the St. Louis Public Service Company, St. Louis, Mo. He formerly was division superintendent of the North Broadway station.

F. A. Wilson, who was division superintendent of the DeBaliviere car station, has been made temporary division superintendent of the North Broadway car station while John H. Rippen, former superintendent of methods, is temporarily filling Mr. Wilson's old post at the DeBaliviere sheds.

James Stewart has been promoted to the superintendency of the Virginia and Walsh station, which houses the Grand and Belleville cars. He had been day dispatcher at this station for the past eight years.

M. L. Cummings Directs Salt Lake Advertising and Publicity

M. L. Cummings, Jr., associated with the advertising and public relations activities of the Utah Power & Light Company for several years, has recently been placed in charge of advertising and publicity for the Utah Light & Traction Company, Salt Lake City, Utah. Mr. Cummings is also editor of the Utah Power & Light Company's house organ, "The Synchronizer." He will retain his present connection with the power company, and assumes the additional duties with the company operating the railway and bus lines.

Mr. Cummings became associated with public utility work in March, 1915, at which time he entered the employ of the Utah Power & Light Company as secretary to S. R. Inch, who at that time was general superintendent of that company. About three years later he became identified with the commercial department, was appointed editor of the company's house organ, and in that capacity gained his first experience in public relations work. In 1922 he began to devote the major part of his time to the company's advertising and publicity activities, and in the latter part of 1924, when the Utah Power & Light Company organized its own advertising department, he was made assistant manager of that department.

M. L. Cummings

Mr. Cummings has been closely associated with the activities of the Electrical League of Utah ever since it was organized about nine years ago. He has served as chairman of its publicity committee; and as chairman of its Christmas home lighting committee for the past four years. He was recently elected secretary and treasurer of that organization for the year 1929.

◆

L. F. Yetman, newly appointed chief clerk for the El Paso Electric Company, El Paso, Tex., has reached that city. He was formerly with the Blackstone Valley Gas & Electric Company, where he had long experience. More recently he had been active head of the accounting department of the company at Woonsocket, R. I.

R. J. S. Pigott Rejoins Stevens & Wood

R. J. S. Pigott, for three years mechanical engineer with Stevens & Wood, Inc., and later consulting engineer with the Public Service Production Company and Smoot Engineering Corporation, has returned to the Stevens & Wood organization as consulting mechanical engineer.

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J. H. Shearer Elected Head of Pennsylvania Utility

J. H. Shearer, vice-president and general manager Penn Central Light & Power Company, Altoona, Pa., was elected president of that company, at a meeting of the board of directors held March 20, and of its subsidiary and associated companies, including the Keystone Public Service Corporation and subsidiaries, the Altoona & Logan Valley Electric Railway and subsidiaries, the York Railways and subsidiaries and the Chester Valley Electric Company.

Mr. Shearer entered the public utility field with the Thomson-Houston Company in 1890. He became identified with the public utility industry in the East as general superintendent of the Eastern Shore Gas & Electric Company at Salisbury, Md., and later Day & Zimmermann, managers of the Eastern Shore utility, selected him for the position of general superintendent of the Penn Central Light & Power Company. In 1923 he was elected vice-president in charge of operation and three years ago, when the National Electric Power Company acquired the Penn Central properties, he was appointed vice-president and general manager and a member of the board of directors.

◆

Samuel A. Lockhart Promoted at Fall River

Samuel A. Lockhart, formerly operating foreman, was appointed superintendent of transportation of the Fall River, Mass., division of the Eastern Massachusetts Street Railway on Feb. 18. Mr. Lockhart has served in several capacities for the company through a period of 26 years. His first employment with the company in 1903 was as a motorman, operating from the old North carhouse in Fall River. Later he was promoted to foreman of the North carhouse, the headquarters for all the cars of the division. His next step was to the transportation department, in which he became chief operating foreman. Mr. Lockhart served in this position for sixteen years before receiving his recent appointment.

When Mr. Lockhart started his career as a motorman, the Old Colony Street Railway was furnishing transportation in Fall River. While serving in his various positions he saw the company change to the Bay State and then to the Eastern Massachusetts Street Railway.

Mr. Lockhart was born, reared and educated in Fall River. He has participated in several local activities in the city, and at the present time is president of the Maplewood Baseball League, composed of the leading amateur teams of Fall River. He also has been successful in developing the athletic activities of his division.

◆

Edwin D. Crowley, Lynn, has been appointed treasurer of the Eastern Massachusetts Street Railway, Boston, Mass., by the public trustees of the company. Mr. Crowley is a graduate of Dartmouth College, 1923, and the Amos Tuck School of Administration, 1924, with the degree of Master of Commercial Science. He was admitted to the bar in 1927 and authorized to practice as a certified public accountant in 1928.

W. D. Schuyler, for 21 years traffic superintendent of the railway lines in Muscatine, Iowa, has joined the new Muscatine Coach Lines. This service supplanted the electric railway on March 1 He will be traffic superintendent of the new transportation system.

OBITUARY

John L. Heins

John L. Heins, who was president of the Coney Island & Brooklyn Railroad, Brooklyn, N. Y., before its absorption some years ago by the Brooklyn Rapid Transit Company, the predecessor of the Brooklyn-Manhattan Transit Company, is dead, in his eighty-fifth year.

Moving to Brooklyn when still in his twenties, Mr. Heins became superintendent of the Franklin Avenue line there, but ill health subsequently caused his resignation. He returned to one of the roads that later was included in the merger that formed the Coney Island & Brooklyn Railroad, and remained in that field during the remainder of his active career, assuming the presidency and chairmanship of the board of the Coney Island & Brooklyn Railroad on its formation 30 years ago.

As president of the Coney Island & Brooklyn Railroad he succeeded Col. John L. Partridge. He was in turn succeeded as president of the company by Slaughter W. Huff, who later became a vice-president of the Brooklyn Rapid Transit Company when control of the Coney Island property passed to the Brooklyn Rapid Transit. The Equitable Life had been a large holder of stock of the Coney Island & Brooklyn Railroad, one of the most prosperous companies of its kind in the country in its day, but competition and other circumstances militated against the company and the Equitable holdings eventually found their way to the ownership of the Brooklyn Rapid Transit at prices considerably under par, whereas at one time the stock had sold at a magnificent premium. To Mr. Huff, as the successor of Mr. Heins, fell the task of rehabilitating the road.

George B. Cornell

George Birdsall Cornell, for nearly 50 years actively identified with the construction of electric railways in the United States, and in the evaluation of public utility properties throughout the world, died on March 14. Mr. Cornell's earliest notable work was as chief engineer of construction of the Brooklyn Elevated Railway, in 1884-'86. He retired in 1927, after completing an evaluation of the property of the Philadelphia Company.

From 1895 to 1898 Mr. Cornell, as chief engineer New York & Brooklyn Bridge Railway, installed the first elevated trains to cross Brooklyn Bridge. He also installed the first electrical equipment in the Brooklyn elevated system. Before that he had been chief engineer of the construction of the South Side Elevated Railroad in Chicago, and of the Union Elevated Railway in Brooklyn.

He was associated as resident engineer of Ford, Bacon & Davis, Inc., and was engaged in the construction of the railway power plant and overhead lines of the Memphis Street Railway, Memphis, Tenn., in 1906 and 1907. For the next six years he was chief engineer for Meiklehan & Dinsmore, engineers and bankers. Mr. Cornell returned to Ford, Bacon & Davis as resident engineer in Richmond, Va., from 1918 to 1921. He designed utility plants and evaluated properties in and around New York and gave expert testimony in various public utility investigations.

He was graduated from the Columbia College School of Mines in 1877 and held the degrees of Civil Engineer and Engineer of Mines. He was a life member of the American Society of Civil Engineers.

◆

Horace J. Cochran, former president Maysville Public Utilities Company, operators of utilities prior to the sale of the power, light and street car divisions to the Kentucky Power & Light Company, about three years ago, died recently. Mr. Cochran, a native of Maysville, was 52 years old.

Charles Bruce White, Chicago representative of the Cochrane Corporation and vice-president and general manager of the Cochrane Engineering Company, Chicago, died in Chicago recently. He had charge of building the electric railroad at Lynchburg, one of the first of its kind in the South. At the age of 34 he went to Chicago and was chief electrician for the Calumet Street Railway; he later entered the service of the Western Electric Company as a salesman, and in 1900 became manager of the Sprague Electric Company's office in St. Louis. In 1901 he became associated with A. Sorge Jr. & Company, then representing the Harrison Safety Boiler Works, (now the Cochrane Corporation), with which he was associated until the death of Mr. Sorge seven years ago. He was then made vice-president and general manager of the Cochrane Engineering Company, which succeeded A. Sorge Jr. & Company.

Equipment Orders Continued

Grand Forks Street Railway to purchase car and bus equipment. Louisville Railway tests trucks. Track and shop construction planned

EXPANSION and renovation of railway systems and equipment have played an important part in the market activity of the electric railway industry during the past winter. With the coming of spring there appears to be no abatement in the announcement of projected improvements for this year. The delivery of 100 cars to the city of Detroit has just been started and now that city is making a special survey to ascertain if an additional 100 cars will be needed. Chicago has placed orders for 100 cars and other cities have either ordered or are contemplating the order of car equipment. Several large construction projects have been commenced and additional rehabilitation is being proposed or planned in a number of cities.

Cars for Grand Forks

Grand Forks Street Railway, Grand Forks, N. D., is considering the purchase of two or three new street cars of the Birney safety type. If these cars are to be ordered equipment similar to the present cars will be preferred. These cars are built for extremely cold weather operation, being equipped with double flooring, head lining and storm windows. The trucks are the St. Louis No. 7 type and the cars are equipped with G. E. No. 264 motors, No. 25 C P air compressors and are heated with Peter Smith hot-air heaters.

The Grand Forks Street Railway is also considering the purchase of buses to be used as feeders or possibly to replace one or two branches of its system where track conditions are such that it may be found prohibitive to rebuild them. Although a definite decision has not been made, the matter is being thoroughly investigated and some plan will be adopted in the very near future.

The Street Railway Department of the city of Detroit, Mich., has returned five mechanical-drive buses to the manufacturer for the installation of General Electric gas-electric drives. These five buses have been in service for some time and it is believed that this is the first case of conversion of buses already in service to gas-electric drives. The Street Railway Department now has in service 100 gas-electric buses.

Work on the three-year program of relocating elevated columns at the downtown street intersections in Chicago has been completed. A total of 35 columns were relocated from the center to the side of the street at an approximate cost of $470,000.

Louisville Railway, Louisville, Ky., has placed orders with the Timken Detroit Axle Company for two trucks. These trucks are each to be equipped with two 50-hp. motors of the Westinghouse high-speed type. These two trucks are to be installed for experimental purposes on car No. 1050, operating on the Fourth Avenue line. This car, which is one of the company's better steel cars, has been completely rebuilt and equipped with treadle-exit doors, safety devices and leather upholstered seats. The seating capacity is 43 passengers. The car with the old trucks weighs approximately 43,000 lb., while it is estimated with the new trucks the weight will be reduced to 33,000 lb.

It is figured that the car will have an acceleration of 3 to 3½ m.p.h.p.s. as compared to 2 m.p.h.p.s. with the old equipment. The drive is of the worm-gear type and the brakes are on the end of the armature shaft. Delivery of these trucks is expected about May 15, and if tests prove satisfactory, similar trucks will probably be installed on a number of the railway cars where a quicker acceleration and less current consumption is desired.

Equipment Ordered

The Pacific Gas & Electric Company has ordered two carloads of weatherproof wire and four carloads of bare copper wire. Among track material ordered by the Connecticut Company, New Haven, Conn., is one double-track three-part Y; one double-track branch-off; one double-track electric over single-track steam crossing and two crossovers. This company has also ordered four 29-passenger Mack coaches. The Portland Electric Power Company, Portland, Ore., has ordered three A. C. F., 40-passenger, metropolitan type coaches. One Mack six-cylinder, 33-passenger, city type bus has been ordered by the Houston Electric Company, Houston, Tex. The Portland Electric Power Company, Portland, Ore., plans two equipment storage and distributing plants, one costing approximately $200,000 and another about $50,000. The Puget Sound Power & Light Company, Seattle, Wash., will make improvements in its power plant costing approximately $200,000.

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has placed orders for ten cars of poles, two cars of wire and cable and one car of crossarms. This company has also let contracts for the construction of a new substation. The Dallas Railway & Terminal Company, Dallas, Tex. has placed orders for one carload of creosoted pine poles, and 150 21-in. rolled-steel wheels.

The Public Service Co-ordinated Transport, Newark, N. J., has received approval of the Board of Public Utility Commissioners of New Jersey on a contract between this company and the city of Newark on the construction of a rapid transit railway to be built in the bed of the abandoned Morris Canal.

It is understood that until about March 27 the Pennsylvania Railroad, Philadelphia, Pa., will receive bids for the construction of a modern twenty-story office building to be built between Sixteenth and Seventeenth Streets, in Philadelphia. Graham, Anderson, Probst and White, Chicago, Ill., are the architects.

Montreal Tramways, Montreal, Ont., is contemplating the erection of a carhouse and two substations. One of the substations to be located in the west end of the city will have a capacity of about 4,000 kw. and the other in the east end of the city will have a capacity of about 3,000 kw.

Laying of a second track on the Hamilton Road line for a distance of about 1½ miles is being considered by the London Street Railway, London, Ont. The estimated cost of this work is $36,000 a mile exclusive of the cost of removing the present single track.

The Ford City Council has passed a resolution requesting the management of the Ontario Hydro-Electric Railway to extend its car line on Seminole Street from George Avenue to Norman Road. This work, which is estimated to cost approximately $8,000, is to start at the opening of this year's construction season, if the request is approved.

Tacoma Track Construction

Extension of the Municipal Belt Line around the head of Hylebos Water Way and along the east side thereof as far north as Lincoln Avenue has been approved by the Tacoma Chamber of Commerce, Tacoma, Wash., in its ten-year program for the development of that city, particularly the east side of the Hylebos Water Way, for industrial purposes. This improvement also includes the extension of the line as far north as East Eleventh Street. At present there is no bridge across the water way which can carry the belt line tracks and there is no roadway serving the east side south of Lincoln Avenue.

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has received a decision giving it the right to move a park statue in Caledonia, thus permitting the construction of straight tracks on the railway's new right-of-way.

Ohmer Company to Expand

The Ohmer Fare Register Company, Dayton, Ohio, said to be the largest manufacturer of taximeters in the world and an important manufacturer of truck auditors, hubometers and other fare registers, as well as cash registers, plans a large expansion program. The company has authorized the sale of a large block of its class A stock to F. J. Lisman & Company, New York, and will use the proceeds of such sale to provide for the retirement of its short term notes, the payment of existing bank loans, the retirement of all or substantially all of its preferred stock and for expansion purposes, particularly in the field of recording and registering machines. The company has also authorized the issue of 20,000 shares of the class B stock in exchange for certain valuable patents.

At a special meeting of its stockholders and a special meeting of its board of directors, action necessary to carry out a plan of recapitalization of the company was taken. The plan of recapitalization provides, among other things, for an increase in the authorized capital stock of the company from 15,000 shares (par $100) to 504,922 shares, of which 4,922 shares, known as preferred stock, will have a par value of $100 per share, 100,000 shares, known as class A stock, will have no par value, and 400,000 shares known as class B stock will have no par value. It is contemplated that the 4,922 shares of preferred stock, which are temporarily carried over from the old capitalization, will be retired out of the proceeds of the sale of class A stock by the company, and that there will presently be outstanding 100,000 shares of the class A stock and 270,000 shares of the class B stock. Holders of present common stock will receive in exchange for each share held 2 7/9 shares of the new class A stock and 25 shares of the new class B stock.

The board of directors has been increased from six members to nine, and F. J. Lisman and A. M. Chambers of the banking firm of F. J. Lisman & Company have been elected to the board.

It is expected that F. J. Lisman & Company will, in the near future, make a public offering of a block of the class A stock.

John F. Ohmer, president Ohmer Company, has made it plain that no business change is being considered which might bring about a merger of his company with others engaged in similar lines of industry. Expansion is contemplated, but whatever is done will not in any way affect the present directorate of the concern. He is quoted as follows:

> The increase which we have enjoyed in our business during the past year and the prospects for the future in cash register and accounting machine business, a field we entered some time ago, has made it necessary that we be prepared to have a financial structure that will take care of the expansion.

The Ohmer Company will soon place in production its new models of cash registers and accounting machines, while continuing with the manufacture of fare-recording machines which has been the nucleus of the business since its inception.

METAL, COAL AND MATERIAL PRICES F. O. B. REFINERY

	March 20, 1929
Metals—New York	
Copper electrolytic, cents per lb.	22.45
Copper wire, cents per lb.	24.875
Lead, cents per lb.	8.
Zinc, cents per lb.	6.825
Tin, Straits, cents per lb.	49.
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$4.425
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.80
Franklin, Ill., screenings, Chicago, net tons	1.50
Central, Ill., screenings, Chicago, net tons	1.125
Kansas screenings, Kansas City, net tons	1.70
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000ft.	$6.95
Weatherproof wire base, N.Y., cents per lb.	25.875
Cement, Chicago net prices, without bags	2.05
Linseed oil (5-bbl. lots) N. Y., cents per lb.	10.6
White lead in oil (100-lb. keg), N. Y., cents per lb.	13.5
Turpentine (bbl. lots), N. Y., per gal	64.5

* * *

Westinghouse Annual Report

Business of the Westinghouse Electric & Manufacturing Company during the year 1928 was the best for any twelve months in its history, according to the company's annual report, which was made public recently. Sales billed for the year were $189,050,302, and net income was $20,814,940, which figures exceed previous records by $3,500,000 and $2,700,000, respectively. The net income per share of stock (preferred and common) was $8.78, or 17.5 per cent on the par value, which compares with $6.59, or 13.2 per cent for the period covered by the last annual report. Both classes of stock are now receiving annual dividends of $4 per share of $50 par value.

Owing to a change in the fiscal year, which now ends Dec. 31, instead of March 31 as heretofore, the present report covers officially only the nine-months period extending from April 1 to Dec. 31, 1928, but the figures above given are for the entire year of 1928 to provide a basis for comparison with previous full fiscal years.

The company's total current assets are given as $135,679,223 (a gain of over $13,000,000 in nine months), and its total current liabilities are only $17,000,000. The surplus is now $67,000,000, a gain of $10,000,000 in nine months.

The value of unfilled orders on Dec. 31, 1928, was approximately $47,000,000. During the nine-months period the value of orders received exceeded by almost $20,000,000 that of the same period in 1927, due largely to the increase in demand for radio products and industrial motor apparatus.

* * *

Weekly Business Conditions

The volume of money turnover during the week ended March 16, as indicated by check payments, was smaller than in the preceding week but considerably greater than a year ago, according to the weekly statement of the Department of Commerce. Industrial activity, as reflected by steel-plant operations, was greater than in either the preceding week or the similar period a year ago. The production of bituminous coal during the latest reported week was smaller than in either the previous week or the similar week of 1928. The output of lumber showed a decline from the previous week and no change from a year ago. Petroleum output showed a sizeable recession from the previous week but was considerably greater than at this time last year. Freight-car loadings, covering the latest reported week, showed a gain over both the previous week and the similar period of last year.

The general level of wholesale prices showed no change from the preceding week, but was fractionally higher than a year ago. The price of copper continued to mount, while prices for iron and steel, showing no change from the previous week, averaged higher than a year ago. Loans and discounts of federal reserve member banks showed further expansion, as compared with both the preceding week and the similar period a year ago. Interest rates on call loans averaged lower than in the previous week but were higher than a year ago. Bond prices averaged lower than in either period. Prices for stocks were higher than in either the previous week or the similar period of 1928. Business failures were fewer than in either period.

Weekly Business Indicators

(Weeks ended Saturday. Average 1923-25 = 100)

	1929				1928			
	March 16	March 9	March 2	Feb. 23	March 17	March 10	March 3	Feb. 25
Steel operations	123.7	122.4	118.4	117.1	109.0	108.0	109.0	111.0
Bituminous-coal production	.....	105.4	114.5	120.6	102.0	106.6	103.0	104.4
Lumber production	.....	99.1	101.4	96.4	102.3	99.1	101.4	108.6
Petroleum production (daily average)	.....	128.0	129.8	129.3	114.7	113.1	113.2	112.8
Freight-car loadings	.....	.....	101.9	94.6	98.3	99.2	100.1	90.7
Building contracts 37 states (daily average)	.....	93.2	124.5	93.1	139.4	110.0	111.0	122.2
Price iron and steel, composite	87.9	87.9	87.9	87.6	86.7	87.6	86.5	86.0
Copper, electrolytic, price	.....	139.9	139.1	129.0	100.7	100.7	100.0	100.0
Check payments	130.6	157.8	124.8	145.5	114.4	126.6	123.7	105.3
Bank loans and discounts	131.5	131.4	130.9	129.5	122.6	121.2	121.2	120.4
Interest rates, call money	178.8	218.2	187.9	169.7	109.1	103.0	109.1	103.0
Business failures	113.0	120.4	131.9	101.0	117.0	125.3	126.8	118.7
Fnterest rates, time money	180.0	177.1	177.1	177.1	105.7	105.7	105.7	105.7
Iederal reserve ratio	91.2	89.9	90.2	91.4	95.9	96.0	95.6	96.4

"The man at the wheel

was made to feel secure from the winds that blew"

So runs an old song of the sea. But does it hold good for your own men at the wheel? Do they feel secure in the knowledge that they have a good hand brake for emergencies?

Can they feel certain their car is going to stop when they apply that brake? Can they rely on it functioning in spite of worn brake shoes or slack rigging?

If not, it is high time for you to consider installing a set of Peacock Staffless Brakes on each of your present cars, and for you to specify them on your new equipment.

May we tell you about the five big safety features of Peacock Staffless Brakes that give both you and your motormen that feeling of security?

"Peacock"

Reg. U. S. Pat. Off.

Staffless Brakes

NATIONAL BRAKE COMPANY
890 Ellicott Square, Buffalo, N. Y.

Canadian Representative:
Lyman Tube & Supply Co., Ltd., Montreal, Can.
The Ellcon Co., General Sale Representative:
50 Church St., New York

Next Issue—

The *New*

Electric Railway Journal *Monthly*

The next issue of this magazine will introduce your business paper in its new *monthly* form and will inaugurate an expanded program under which the editorial and advertising pages will be concentrated into a bigger and stronger publication.

Electric Railway Journal *News*, to be issued each Saturday except in those weeks in which the monthly publication appears, will supplement the monthly magazine and give to busy executives the important timely news of the industry.

Please advise us promptly

There will be 13 issues of the monthly—twelve regular issues and the 13th issue which will be either a Convention Issue or Report Issue depending upon the date of the A.E.R.A. Convention itself.

Present subscribers are now offered a choice of:

1. The regular subscription price of the magazine is being reduced from four dollars to three dollars yearly. The price of the News Service will be one dollar for subscribers to the magazine, two dollars for all non-subscribers. If you wish the new monthly—*without* the News Service—your present subscription will be *extended* on a dollar-for-dollar basis.

2. If you are interested in receiving *both* the 13 large monthly issues and the 39 weekly News issues, your subscription will not be extended, but will retain its present expiration date.

Which choice do you prefer? Your advice will be appreciated at an early date so the mailing of future issues can be made in line with your wishes.

The April issue, in addition to inaugurating the new monthly schedule will be one of the most important Annual Maintenance and Construction Numbers that Electric Railway Journal has published. It will be a comprehensive survey of local transportation maintenance practices and methods covering the many phases of electric railway operation. A survey of new car experience . . . How southern properties reduce equipment costs . . . Bus garage and shop design on 50 properties . . . Using track maintenance as a guide in design . . . are only a few of the important subjects to be discussed.

Next week the April issue will be in your hands. We will appreciate your comments and suggestions—and urge that you advise us of your subscription choice immediately.

Electric Railway Journal

A.B.P. *A McGraw-Hill Publication* A.B.C.

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INCREASED Revenue possibilities of tickets in books, pads and strips are:

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5. Spent more readily than money;
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Girder Rails, Special Trackwork, Switches, Frogs and Crossings in Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail

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GARAGE and shop floors are always "danger spots" unless they are kept slip-proof and clean. By using Oakite materials to remove accident-causing slipperiness, you can keep floors safe and sanitary at remarkably low cost.

Let our nearest Service Man show you Oakite methods for cleaning wood, cement or composition flooring. He will tell you how to clean up the most stubborn caked on dirt in record time. A postal to us will bring him. No obligation, of course.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

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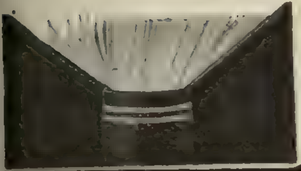
OAKITE

TRADE MARK REG. U. S. PAT. OFF.

Industrial Cleaning Materials and Methods

The Standard Work
on the Theory and Practice
of Electric
Railway Engineering



This standard work covers the theory and practice of electric railway engineering. In its present third edition it has been thoroughly revised and somewhat enlarged. The book is divided into three sections. It covers the principles of train operation, power generation and distribution, equipment.

Electric Railway Engineering

By C. FRANCIS HARDING
Professor of Electrical Engineering; Director, Electrical Laboratories, Purdue University

Assisted by DRESSEL D. EWING
Professor of Electric Railway Engineering, Purdue University

Third Edition, 480 pages, 6 x 9, 248 illustrations, $5.00

Covers latest research and developments

A chapter has been added in this third edition to introduce some of the economic problems involved in motor-bus transportation. The developments in automatic substations and the results of braking tests on interurban cars are also included. All of the chapters involving applications, engineering practice or the results of new research or developments have been completely revised, augmented and illustrated with recent photographs or drawings. Following the trend of the times, the chapter on "Power Station Location and Design" gives way to that entitled "Sources of Electrical Energy," which contains in detail one of the most recent and complete contracts for electrical energy ever negotiated.

Chapter Headings

PART I.—Principles of Train Operation.
1. History of Electric Traction.
2. Traffic Studies (Predetermined).
3. Traffic Studies (Existing).
4. Train Schedules.
5. Motor Characteristics.
6. Speed-time Curves (Components).
7. Speed-time Curves (Theory).
8. Distance, Current, and Power-time Curves (Theory).
9. Speed-distance, Current and Power Curves (Concrete Examples).
10. Speed-time Curves (Straight-line).
11. Locomotive Train Haulage.

PART II.—Power Generation and Distribution.
12. Substation and Power-station Load Curves.
13. Distribution System.
14. Substation Location and Design.
15. Transmission System.
16. Sources of Electrical Energy.
17. Bonds and Bonding.
18. Electrolysis.

PART III.—Equipment.
19. Signals and Dispatching Systems.
20. Track Layout and Construction.
21. Cars.
22. Motor Busses.
23. Motors.
24. Control Systems.
25. Brakes.
26. Car-house Design.
27. Electrical Locomotives.
28. Electrification Systems.
29. Electric Traction on Trunk Lines

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Special TRACKWORK

It is the super-enduring qualities of Tisco Manganese Steel—the original in the trackwork field—and workmanship born of painstaking care, that keep Wharton trackwork in the vanguard.

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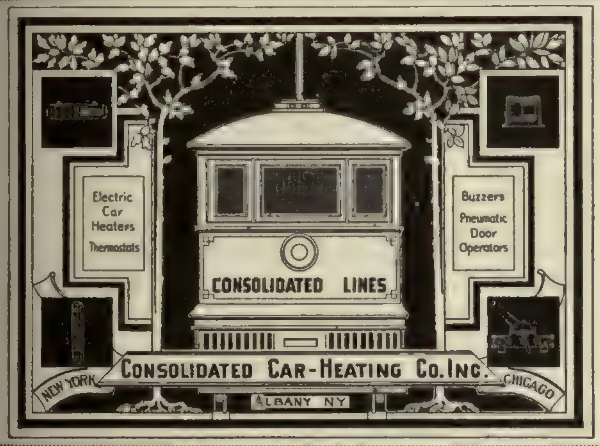

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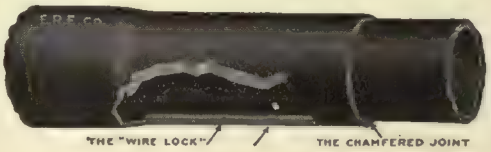

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Lowest Cost
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Bethlehem Products for Electric Railways

Tee and Girder Rails; Machine Fitted Joints; Splice Bars; Hard Center Frogs; Hard Center Mates; Rolled Alloy Steel Crossings; Abbott and Center Rib Base Plates; Rolled Steel Wheels and Forged Axles; Tie Rods; Bolts; Tie Plates and Pole Line Material.

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BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

BETHLEHEM

The Ideal Insulation for Electric Railways

INSULATED WIRES and CABLES
OKONITE, MANSON and DUNDEE TAPES

POWER CABLES, SIGNAL CABLES
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THE OKONITE COMPANY

THE OKONITE-CALLENDER CABLE CO., INC.,
Factories: Passaic, N. J. Paterson, N. J.
Sales Offices: New York, Chicago, Pittsburgh, St. Louis, Boston, Atlanta, Birmingham, San Francisco, Los Angeles, Seattle, Dallas.

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Okonite Quality Standards Unchanged for Half a Century

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BOXES for BUSES

Let us tell you of this especially designed box for this class of service.

The Cleveland Fare Box Co.
4900 Lexington Ave., Cleveland, O.

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COIN COUNTING AND SORTING MACHINES
CHANGE CARRIERS, TOKENS

The DIFFERENTIAL CAR

Standard on 60 Railways for

Track Maintenance
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Ash Disposal
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Concrete Materials
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Differential Crane Car
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Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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B.J.

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EXECUTIVE engineer. I am in the best years of my life. Have had 20 years' experience with a large Eastern property as cadet engineer, track foreman, roadmaster, superintendent M. of N., and division manager. Now employed, but desire to make a change for personal reasons. PW-168, Electric Railway Journal, Tenth Ave. at 36th St., New York.

SUPERINTENDENT transportation, qualified by wide experience, proven successful record, every phase of transportation. Successful in employe and public relations, increasing revenue, decreasing operating costs. Available short notice. Fine references. PW-167, Electric Railway Journal, Tenth Ave. at 36th St., New York.

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The following Sangamo Economy Watt Meters:

34—600 volts, 300 amp. Meters, 120 watthours per disk revolution.

28—600 volts, 100 amp. Meters, 40 watthours per disk revolution. Above meters in A-1 condition.

For Sale or Exchange

8—Westinghouse 506 Motors complete and and in good running condition, less pinions and gear cases, in exchange for Westinghouse 508 Motors.

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WANTED

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4—Second hand Brill Trucks Model 79-E-1.

GARY RAILWAYS COMPANY
1085 Broadway, Gary, Indiana

If there is anything you want—

or something you don't want that *other* readers of this paper can supply—or use—advertise in the

SEARCHLIGHT SECTION

Somebody is always looking for something to meet certain business needs. Some men in charge of plant operations may be in the market for good used equipment—others may have just what they want, to sell. Some may require a man of unusual qualifications for a particular position—that man may be another reader of this paper!

Put the Searchlight Section to work for you under any of the following classifications—to fill your business needs.

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Agents Wanted
Auction Notices
Buildings For Sale
Business Opportunities
Civil Service Opportunities
Contracts To Be Let
Contracts Wanted
Educational Courses
Employment Agencies
Exchanges
For Rent Items
Franchises
Industrial Sites
Miscellaneous Wants
New Industries Wanted
Partners Wanted
Patents For Sale
Patent Attorneys
Plants For Sale
Positions Vacant
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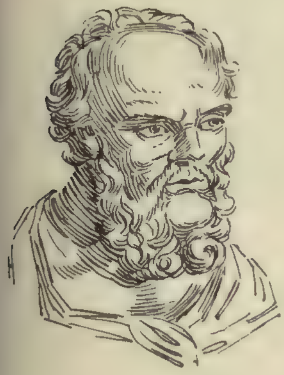
Property For Sale
Receivers' Sales
Representative Wanted
Salesmen Wanted
Work Wanted
Etc., Etc., Etc.



Socrates was right

"He is not idle who has nothing to do; but he is idle who might be better employed."

And there's a world of truth today in these words, centuries old. There's a modern thought, too, for electric railway executives who are anxious to keep idleness away from their plant.

WHAT is idle in your organization today?

Obsolete cars are idle — not so much because they are out of service as because they might be "better employed."

The space they clutter up is idle—not so much because it has "nothing to do" as because it "might be better employed" than being occupied with obsolete cars and antiquated equipment.

The way to "better employ" obsolete cars is to scrap them—and turn their scrap value into cash! By so doing, you not only put an end to the worst type of idleness a car can be guilty of, but you also put an end to the costly idleness of the space used for their storage.

May we tell you more in detail of the service we have rendered for the past thirty years to other traction companies and what we can do for you?

We are not alchemists—but—we turn iron and steel into gold and silver.

L. Schiavone & Bonomo Bros. Inc.

Jersey City, New Jersey

WHAT AND WHERE TO BUY

Equipment, Apparatus and Supplies Used by the Electric Railway Industry with Names of Manufacturers and Distributors Advertising in this Issue

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Electric Railway Journal* assumes no responsibility for errors or omissions.

Advertising, Streeet Car
Collier, Inc., Barron G.

Air Brakes
General Electric Co.
Westinghouse Tr. Br. Co.

Air Circuit Breakers
Roller-Smith Co.

Ammeters
Roller-Smith Co.

Anchors, Guy
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Armature Shop Tools
Columbia Machine Works
Elec. Service Supplies Co.

Automatic Regulators, Voltage, Current & Synchronizing
American Brown Boveri Electric Co.

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Cincinnati Car Co.
Illinois Steel Co.
Westinghouse E. & M. Co.

Babbitting Devices
Columbia Machine Works

Badges and Buttons
Elec. Service Supplies Co.
International Reg. Co., The

Batteries, Dry
Nichols-Lintern Co.

Bearings, Anti-Friction
Hyatt Roller Bearing Co.

Bearings and Bearing Metals
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Cincinnati Car Co.
Columbia Machine Works
Stucki Co., A.

Bearings, Roller
Hyatt Roller Bearing Co.

Bells and Buzzers
Consolidated Car Htg. Co.

Bells and Gongs
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
Elec. Service Supplies Co.

Benders, Rail
Railway Trackwork Co.

Bodies, Bus
Brill Co. The J. G.

Bolts, Case Hardened
American Steel Foundries
Bemis Car Truck Co.

Bolts and Nuts, Track
Illinois Steel Co.

Bond Testers
Electric Service Supplies Co.
Roller-Smith Co.

Bonding Apparatus
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Bonds, Rail
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Books
McGraw-Hill Book Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Brake Adjusters
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Lining, Asbestos
Johns-Manville Corp.

Brake Shoes
American Brake Shoe & Found. Corp.
Bemis Car Truck Co.
Brill Co., The J. G.

Brake Testers
National Ry. Appliance Co.

Brakes, Brake Systems and Brake Parts
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works
General Electric Co.
National Brake Co.
Safety Car Devices Co.
Westinghouse Tr. Br. Co.

Brakes, Magnetic Rail
Cincinnati Car Co.

Brushes, Carbon
General Electric Co.
Morganite Brush Co., Inc.
Westinghouse E. & M. Co.

Brushes, Graphite
Morganite Brush Co., Inc.

Brushholders
Columbia Machine Works
General Electric Co.

Building Materials, Fireproof
Johns-Manville Corp.

Buses
Twin Coach Corp.

Buses, Motor
General Electric Co.
General Motors Truck Co.

Bus Lighting
National Ry. Appliance Co.

Bushings, Case Hardened and Manganese
American Steel Foundries
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.
Columbia Machine Works

Cables (See Wires and Cables)

Cambric Tapes, Yellow and Black Varnish
General Electric Co.

Car Lighting Fixtures
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Car Panel Safety Switches
Consolidated Car Htg. Co.
Westinghouse E. & M. Co.

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Cincinnati Car Co.
Irving Iron Works Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Carbon Brushes (See Brushes, Carbon)

Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.

Cars, Gas-Electric
Brill Co., The J. G.
General Electric Co.
Westinghouse E. & M. Co.

Cars, Gas, Rail
Brill Co., The J. G.

Cars, Passenger, Freight, Express, etc.
American Car Co.
Brill Co., The J. G.
Cincinnati Car Co.
Kuhlman Car Co., G. C.
Twin Coach Corp.
Wason Mfg. Co.

Cars, Self-Propelled
Brill Co., The J. G.

Castings, Brass Composition or Copper
Cincinnati Car Co.
Columbia Machine Works

Castings, Gray Iron and Steel
American Brake Shoe & Found. Corp.
American Steel Foundries
Bemis Car Truck Co.
Columbia Machine Works
Standard Steel Works

Castings, Malleable & Brass
American Brake Shoe & Found. Corp.
Bemis Car Truck Co.
Columbia Machine Works

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Elec. Service Supplies Co.
Ohio Brass Co.

Cements, High Temperature
Johns-Manville Corp.

Change Carriers
Cleveland Fare Box Co.
Electric Service Supplies Co.

Change Trays
Cincinnati Car Co.

Circuit Breakers
American Brown Boveri Electric Co.
General Electric Co.
Roller-Smith Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners
Oakite Products, Inc.

Cleaners and Scrapers, Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.

Coil Banding and Winding Machines
Columbia Machine Works
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Coils, Armature and Field
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Coils, Coke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Changers
Johnson Fare Box Co.

Coin Counting Machines
Cleveland Fare Box Co.
International Reg. Co., The
Johnson Fare Box Co.

Coin Sorting Machines
Cleveland Fare Box Co.
Johnson Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

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Columbia Machine Works
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Commutators or Parts
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Compounds, Insulating
Johns-Manville Corp.

Compressors, Air
General Electric Co.
Westinghouse Tr. Br. Co.

Condensers
General Electric Co.
Westinghouse E. & M. Co.

Conduit Fibre
Fibre Conduit Co.

Conduit Duct Underfloor
Johns-Manville Corp.

Connectors, Solderless
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Htg. Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Columbia Machine Works
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
International Reg. Co., The
Roebling's Sons Co., John A.

Cord Connectors and Couplers
Elec. Service Supplies Co.

Couplers Car
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Cowl Ventilators
Nichols-Lintern Co.

Cranes, Hoists & Lifts
Electric Service Supplies Co

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossings
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Frogs & Switches
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Crossings, Track (See Track Special Work)

Crossings, Trolley
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.

Cutting Apparatus
General Electric Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse Tr. Br. Co.

Dealers' Machinery & Second Hand Equipment
Gary Railways Co.
Monongahela West Penn Public Service Co.
Schiavone, L. & Bonomo Bros., Inc.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Works
Elec. Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G.
Cincinnati Car Co.
Consolidated Car Heating Co.
National Pneumatic Co.
Safety Car Devices Co.

Doors, Folding Vestibule
National Pneumatic Co.
Safety Car Devices Co.

Doors & Door Fixtures
Brill Co., The J. G.
Cincinnati Car Co.
Hale-Kilburn Co.

Drills, Track
Electric Service Supplies Co.
Ohio Brass Co.

Drum Truing Lathes
Nat'l Rlwy. Appliance Co.

Dryers, Sand
Electric Service Supplies Co
Westinghouse E. & M. Co.

Ears
Columbia Machine Works
Electric Service Supplies Co
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Electric Grinders
Railway Trackwork Co.

Electrical Wires and Cables
John A. Roebling's Sons Co.

Electrodes, Carbon
Railway Trackwork Co.
Una Welding & Bonding Co.

Electrodes, Steel
Railway Trackwork Co.
Una Welding & Bonding Co.

Engineers, Consulting, Contracting and Operating
Beeler, John A.
Bibbins, Roland J.
Buchanan & Layng Corp.
Faile & Co., E. H.
Ford, Bacon & Davis
Hemphill & Wells
Holst, Engelhardt W.
Jackson, Walter
Kelker & DeLeuw
McClellan & Junkersfeld
Richey, Albert S.
Sanderson & Porter
Stevens & Wood
Stone & Webster Co.
White Eng. Corp., The J. G.

Engines, Gas, Oil or Steam
Westinghouse E. & M. Co.

Engines, Gasoline
Waukesha Motor Co.

Fare Boxes
Bell Register, Inc.
Cleveland Fare Box Co.
Johnson Fare Box Co.
Nat'l Rlwy. Appliance Co.
Ohmer Fare Register Co.
Perey Mfg. Co.

Fare Registers
Bell Register, Inc.
Electric Service Supplies Co.
Johnson Fare Box Co.
Ohmer Fare Register Co.

Fenders and Wheel Guards
Brill Co., The J. G.
Cincinnati Car Co.
Star Brass Works

Fibre and Fibre Tubing
Westinghouse E. & M. Co.

Field Coils (See Coils)

Floodlights
Electric Service Supplies Co.
General Electric Co.

Flooring, Fireproof
Irving Iron Works Co.

Flooring, Monolithic
Johns-Manville Corp.

Flooring, Non-Slipping
Irving Iron Works Co.

Flooring, Open Steel
Irving Iron Works Co.

Flooring, Steel, Subway
Irving Iron Works Co.

Flooring, Ventilating
Irving Iron Works Co.

Forgings
American Steel Foundries
Brill Co., The J. G.
Cincinnati Car Co.
Standard Steel Works Co.

Frogs & Crossings, Tee Rail
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Frogs, Track (See Track Work)

Frogs, Trolley
Electric Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Furnaces, Electric
American Brown Boveri Electric Co.

Fuses and Fuse Boxes
Columbia Machine Works
Consolidated Car Htg. Co.
General Electric Co.
Westinghouse E. & M. Co.

Gas Electric Drive for Buses
General Electric Co.
Nat'l Rlwy. Appliance Co.

Gas Producers
Westinghouse E. & M. Co.

Continued on page 32

Double Register
Type R-11

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Made in single and double types to meet requirements of service. For hand or foot, mechanical or electric operation. Counters, car fittings, conductors' punches.

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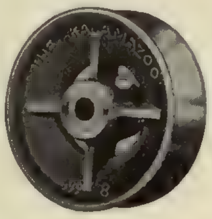

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Chicago, Ill.

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Chilled Rims
and
Chilled Back of Flanges
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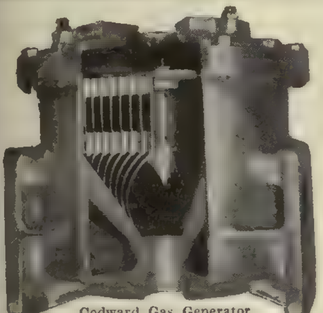

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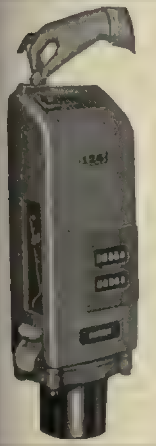
Munsey Bldg., Washington, D. C. 100 Boylston St., Boston, Mass.
Hegeman-Castle Corporation, Railway Exchange Building, Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Calif.
Lister-Reese, Inc., 401 S. Brand Blvd., Glendale, Calif.

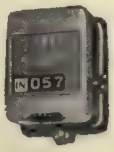
Used and Surplus Equipment

INDIVIDUAL items of used equipment, or surplus new equipment, or complete plants, are disposed of (and found) through advertising in the *Searchlight* Section of this paper.

"SEARCHLIGHT"



Johnson Electric Fare Boxes



and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Over 5000 already in use.

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Johns-Manville Corp.

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Texas Co., The

Gates, Car
Brill Co. The J. G.
Cincinnati Car Co.

Gear Blanks
Brill Co., The J. G.
Standard Steel Works Co.

Gear Cases
Columbia Machine Works
Electric Service Supplies Co.
Westinghouse E. & M. Co.

Gears and Pinions
Bemis Car Truck Co.
Columbia Machine Works
Electric Service Supplies Co.
General Electric Co.
Nat'l Ry. Appliance Co.

Generators
American Brown Boveri Electric Co.
General Electric Co.
Westinghouse E. & M. Co.

Girder Rails
Bethlehem Steel Co.
Lorain Steel Co.

Gongs (See Bells and Gongs)

Grating, Steel Subway
Irving Iron Works Co.

Grease
Texas Co., The

Grinders & Grinding Supplies
Metal & Thermit Corp.

Grinders, Portable
Railway Trackwork Co.

Grinders, Portable Electric
Railway Trackwork Co.

Grinding Bricks and Wheels
Railway Trackwork Co.

Guard Rail Clamps
Lorain Steel Co.
Ramapo Ajax Corp.

Guard Rails, Tee Rail & Manganese
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Guards, Trolley
Elec. Service Supplies Co.
Ohio Brass Co.

Harps, Trolley
Columbia Machine Works
Elec. Service Supplies Co.
Ohio Brass Co.
Star Brass Works

Headlights
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Headlining
Columbia Machine Works

Heaters, Car (Electric)
Consolidated Car Heating Co.
Gold Car Htg. & Ltg. Co.
Railway Utility Co.
Smith Heater Co., Peter

Heaters, Car, Hot Air and Water
Smith Heater Co., Peter

Heaters, Car Stove
Smith Heater Co., Peter

Helmets, Welding
Railway Trackwork Co.
Una Welding & Bonding Co.

Hoists & Lifts
Columbia Machine Works

Hose, Bridges
Ohio Brass Co.

Hose, Pneumatic
Westinghouse Tr. Brake Co.

Instruments, Measuring, Testing and Recording
General Electric Co.
National Ry. Appliance Co.
Roller-Smith Co.
Westinghouse E. & M. Co.

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General Electric Co.
Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.

Insulation (See also Paints)
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
Okonite Co.
Okonite-Callender Cable Co.
Westinghouse E. & M. Co.

Insulation, Paper
Johns-Manville Corp.

Insulator Pins
Elec. Service Supplies Co.
Ohio Brass Co.

Insulators (See also Line Materials)
Elec. Ry. Equipment Co.
Elec. Service Supplies Co
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Jacks (See also Cranes, Hoists and Lifts)
Columbia Machine Works
Elec. Service Supplies Co.

Joints, Rail (See Rail Joints)

Journal Boxes
Bemis Car Truck Co.
Brill Co., The J. G.
Cincinnati Car Co.

Lamp Guards and Fixtures
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Lamps, Arc & Incandescent (See also Headlights)
General Electric Co.
Westinghouse E. & M. Co.

Lamps, Signal and Marker
Elec. Service Supplies Co.
Nichols-Lintern Co.

Lanterns, Classification
Nichols-Lintern Co.

Letter Boards
Cincinnati Car Co.

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Electric Service Supplies Co.

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General Electric Co.
Westinghouse E. & M. Co.

Line Material (See also Brackets, Insulators, Wires, etc.)
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Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Locking Spring Boxes
Lorain Steel Co.
Wm. Wharton, Jr. & Co.

Locomotives, Diesel Electric
American Brown Boveri Electric Co.

Locomotives, Electric
American Brown Boveri Electric Co.
Cincinnati Car Co.
General Electric Co.
Westinghouse E. & M. Co.

Lubricants
Texas Co., The

Lubricants, Oils & Grease
Texas Co., The

Manganese Steel Guard Rails
Ramapo Ajax Corp.
Wm. Wharton, Jr., & Co.

Manganese Steel Castings
Bemis Car Truck Co.
Lorain Steel Co.

Manganese, Steel, Special Track Work
Bethlehem Steel Co.
Wm. Wharton, Jr. & Co.

Manganese Steel Switches Frogs and Crossings
Bethlehem Steel Co.
Lorain Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co.

Mirrors, Inside & Outside
Cincinnati Car Co.

Motor Buses, (See Buses)

Motor & Generator Sets
American Brown Boveri Electric Co.

Motors, Electric
General Electric Co.
Westinghouse E. & M. Co.

Motors, Generators and Controls for Electric Buses
General Electric Co.

Motorman's Seats
Brill Co., The J. G.
Cincinnati Car Co.
Elec. Service Supplies Co.

Nuts and Bolts
American Steel Foundries
Bemis Car Truck Co.
Cincinnati Car Co.

Ohmmeters
Roller-Smith Co.

Oil
Texas Co., The

Omnibuses (See Buses)

Oxy-Acetylene (See Cutting Apparatus)

Packing
Westinghouse Tr. Brake Co.

Packing, Asbestos
Johns-Manville Corp.

Paint, Iron Preservation
Johns-Manville Corp.

Paints and Varnishes (Insulating
Elec. Service Supplies Co

Paints & Varnishes, Railway
National Ry. Appliance Co.

Paving Material
American Brake Shoe & Found. Corp.

Pickup, Trolley Wire
Elec. Service Supplies Co.
Ohio Brass Co.

Pinion Pullers
Elec. Service Supplies Co.

Pinions (See Gears)

Pins, Case Hardened
American Steel Foundries
Bemis Car Truck Co.

Pins, Case Hardened, Wood and Iron
American Steel Foundries
Ohio Brass Co.
Westinghouse Tr. Brake Co.

Pipe Fittings
Standard Steel Works
Westinghouse Tr. Brake Co.

Planers (See Machine Tools)

Plates for Tee Rail Switches
Ramapo Ajax Corp.

Pliers, Rubber Insulated
Elec. Service Supplies Co.

Pole Line Hardware
Bethlehem Steel Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.

Poles, Metal Street
Bates Expanded Steel Truss Co.
Elec. Ry. Equipment Co.

Poles, Ties, Posts, Piling & Lumber
Bell Lumber & Pole Co.
Intern. Creos. & Const. Co.

Poles and Ties, Treated
Bell Lumber & Pole Co.
Intern. Creos. & Const. Co.

Poles, Trolley
Elec. Service Supplies Co.

Poles, Tubular Steel
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.

Portable Grinders
Railway Trackwork Co.

Potheads
Okonite Co.
Okonite-Callender Cable Co., Inc.

Power Saving Devices
National Ry. Appliance Co

Pressings, Special Steel
Cincinnati Car Co.

Pressure, Regulators
General Electric Co.
Westinghouse E. & M. Co.
Westinghouse Tr. Brake Co.

Punches, Ticket
International Reg. Co., The

Rail Braces and Fastenings
Ramapo Ajax Corp.

Rail Grinders (See Grinders)

Rail Joints
Carnegie Steel Co.
Illinois Steel Co.
Rail Joint Co.

Rail Joints, Welded
Lorain Steel Co.
Metal & Thermit Corp.

Rail Welding
Metal & Thermit Corp.
Railway Trackwork Corp.
Una Welding & Bonding Co

Rails, Steel
Carnegie Steel Co.
Illinois Steel Co

Railway Safety Switches
Consolidated Car Htg. Co.
Westinghouse E. & M. Co.

Rattan
Brill Co., The J. G.
Cummings Car & Coach Co
Elec. Service Supplies Co
Hale-Kilburn Co.

Rectifiers Mercury Arc Power
American Brown Boveri Electric Co.

Registers and Fittings
Brill Co., The J. G.
Cincinnati Car Co.
Elec. Service Supplies Co.
International Reg. Co., The
Ohmer Fare Register Co.

Reinforcement, Concrete
Bethlehem Steel Co.

Repair Shop Appliances (See also Coil Banding and Winding Machines)
Elec. Service Supplies Co

Repair Work (See also Coils)
Westinghouse E. & M. Co.

Replacers, Car
American Steel Foundries
Cincinnati Car Co.
Elec. Service Supplies Co.

Resistance
Consolidated Car Htg. Co.
General Electric Co.

Resistance, Wire and Tube
Westinghouse E. & M. Co.

Retrievers, Trolley (See Catchers and Retrievers Trolley)

Rheostats
General Electric Co.
Westinghouse E. & M. Co.

Roofing, Asbestos (Corrugated and Flat)
Johns-Manville Corp.

Roofing and Shingle Asbestos
Johns-Manville Corp.

Safety Control Devices
Safety Car Devices Co.

Sanders, Track
Brill Co., The J. G.
Elec. Service Supplies Co.
Nichols-Lintern Co.
Ohio Brass Co.

Sash Fixtures, Car
Brill Co., The J. G.
Cincinnati Car Co.

Sash, Metal Car Window
Hale-Kilburn Co.

Scrapers, Track (See Cleaners and Scrapers Track)

Screw Drivers, Rubber Insulated
Elec. Service Supplies Co.

Seating Materials
Brill Co., The J. G.
Hale-Kilburn Co.

Seats, Bus
Brill Co., The J. G.
Hale-Kilburn Co.

Seats, Car (See also Rattan)
Brill Co., The J. G.
Cincinnati Car Co.
Hale-Kilburn Co.

Second Hand Equipment
Gary Railways Co.
Monongahela West Penn Public Service Co.
Schiavone, L. & Bonomo Bros., Inc.

Shades, Vestibule
Brill Co., The J. G.
Cincinnati Car Co.

Shovels
Brill Co., The J. G.

Shovels, Power
Brill Co., The J. G.

Side Bearings (See Bearings Center and Side)

Signals, Car Starting
Consolidated Car Htg. Co.
Elec. Service Supplies Co.
National Pneumatic Co.

Signals, Indicating
Nichols-Lintern Co.

Signal Systems, Block
Elec. Service Supplies Co.
Nachod and United States Electric Signal Co.

Signal Systems, Highway Crossing
Nachod and United States Electric Signal Co.

Slack Adjusters (See Brake Adjusters)

Sleet Wheels and Cutters
Cincinnati Car Co.
Columbia Machine Works
Elec. Ry. Equipment Co.
Elec. Service Supplies Co.

Smokestacks, Car
Nichols-Lintern Co.

Snow Plows
National Ry. Appliance C

Snow-Plows, Sweepers and Brooms
Brill Co., The J. G.
Columbia Machine Work

Snow Sweeper, Rattan
J. G. Brill Co.

Soldering and Brazing Apparatus (See Weldin Processes and Apparatu

Special Trackwork
Bethlehem Steel Co.
Lorain Steel Co.
Wm. Wharton, Jr. & Co.

Spikes
Illinois Steel Co.

Splicing Compounds
Westinghouse E. & M. Co.

Splicing Sleeves (See Clam and Connectors)

Springs
National Ry. Appliance C

Springs, Car and Truck
American Steel Foundries
Bemis Car Truck Co.
Brill Co. The J. G.
Cincinnati Car Co.
Standard Steel Works

Sprinklers, Track and Road
Brill Co., The J. G.

Stair Steps, Safety
Irving Iron Works Co.

Steel, Electric Furnace
American Steel Foundries

Steel, Open Hearth
American Steel Foundries

Steel and Steel Products
American Steel Foundries
Carnegie Steel Co.
Illinois Steel Co.

Steps
Irving Iron Works Co.

Steps, Car
Brill Co., The J. G.
Cincinnati Car Co.

Stokers, Mechanical
Westinghouse E. & M. Co.

Stop Signals
Nichols-Lintern Co.

Storage Batteries (See Batteries, Storage)

Strain Insulators
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Strand
Roebling's Sons Co., J. A.

Street Cars (See Cars, Passenger, Freight, Express)

Structural Steel
American Brown Boveri Electric Corp.

Sweepers, Snow (See Snow Plows, Sweepers and Brooms)

Switch Stands and Fixtures
Ramapo-Ajax Corp.

Switchboards, Asbestos
Johns-Manville Corp.

Switches
American Brown Boveri Electric Corp.
General Electric Co.

Switches, Selector
Nichols-Lintern Co.

Switches and Switchboards
Consolidated Car Htg. Co.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Switches, Tee Rail
Ramapo-Ajax Corp.

Switches, Track (See Track Special Work

Synchroscopes
Roller-Smith Co.

Tampers, Tie
Railway Trackwork Co.

Tapes and Cloths (See Insu lating Cloth, Paper and Tape)

Tee Rail Special Track Wor
Lorain Steel Co.
Ramapo-Ajax Corp.

Telephones and Parts
Elec. Service Supplies Co.

Telephone & Telegraph Wir
John A. Roeblings Sons C

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Wednesday

For issue out Saturday

0220

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WELDING ROD

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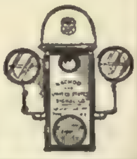
HIGHWAY CROSSING SIGNALS



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LOS ANGELES, CAL.
NIAGARA FALLS, ONT. CANADA

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Wheels, Car, Steel & Steel Tire
American Steel Foundries
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Carnegie Steel Co.
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Standard Steel Works

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MONOPOLY in industry is rapidly passing and happily so for competition tends to improve a product or service. Today, most railways realize the necessity of providing the highest possible degree of useful service to a city or community. These conditions make an improved type of electric car necessary. Brill MASTER UNIT Cars are a distinct advance in mass transportation equipment; they set new standards of design and construction in order to meet the requirements of the riding public.

Community good-will can be attained with this type of equipment. Such confidence is worth winning because increased patronage is the natural result.

Establish community confidence with Brill MASTER UNIT Cars—there is a suitable type for every class of electric railway service. Write for illustrated literature.

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PHILADELPHIA, PA.
AMERICAN CAR CO. — ST. LOUIS MO.
G. C. KUHLMAN CAR CO. — CLEVELAND, OHIO.
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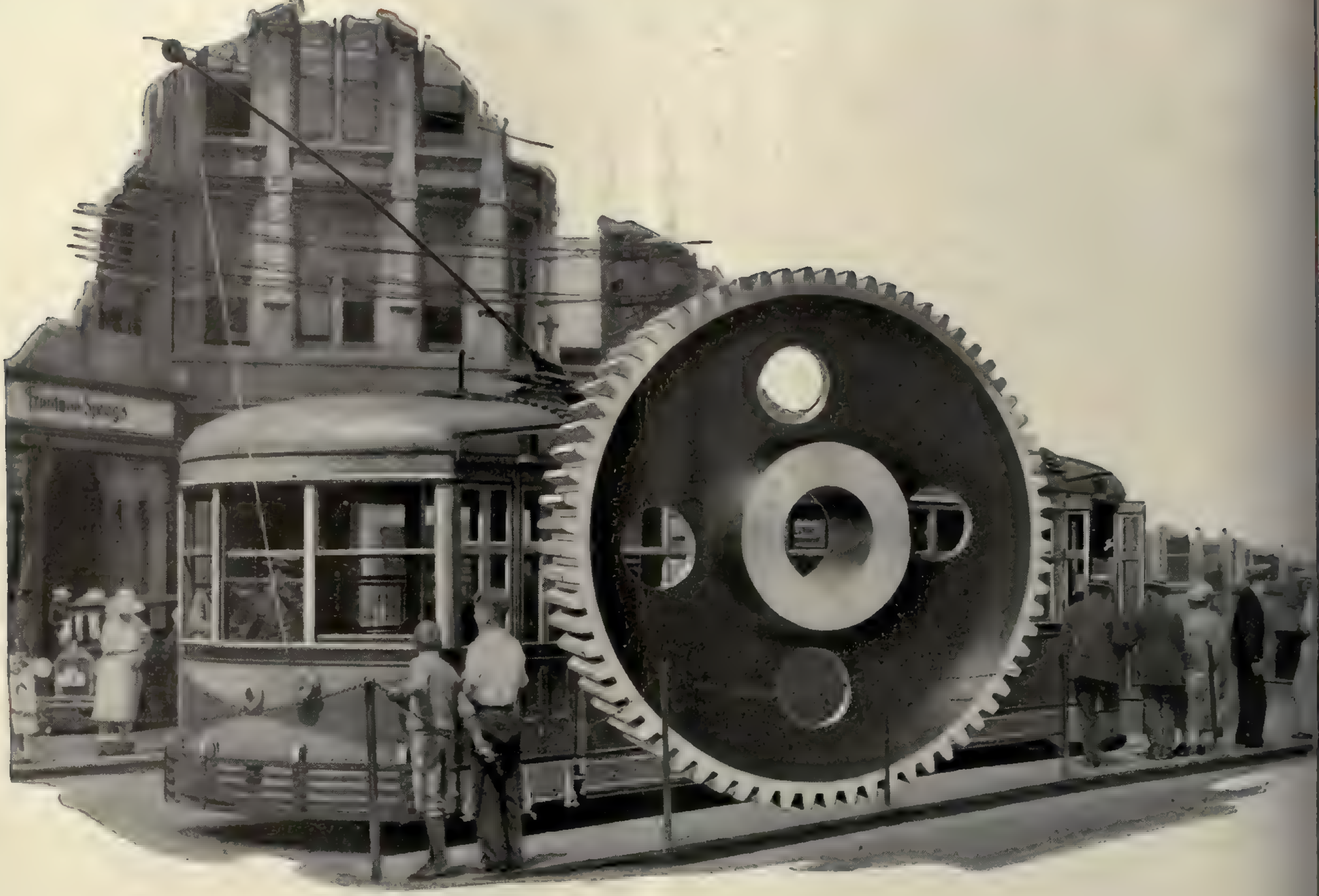
Brill MASTER UNIT Cars



Apply all the force in the working direction

With spur gearing, there are no component forces to cut down the useful work. Consequently, the wear on thrust collars and bearing-lining flanges is minimized.

It will pay you to use G-E standard spur gearing—long-addendum pinions and short-addendum gears—the gearing that need be replaced only when long service has worn it out.

330-100

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ANNUAL MAINTENANCE AND CONSTRUCTION NUMBER

ELECTRIC RAILWAY JOURNAL

Hill Publishing Company, Inc. APRIL, 1929 Thirty-five Cents Per Cop

Machines never tire— never slight their task

Picks, mauls, shovels, crowbars swing briskly in the morning, swing slowly, weakly at night. Machines work steadily, never tire, produce uniform results.

A compression tamper, operated by one man, takes the place of four, turns the revenue from 156 fares into *net* profits every day. Steel Twin Ties and mass production methods build better, more enduring paved track at less cost per track foot, per car pass,—produce more per man-hour.

May we send you further information about modern paved track construction? Have you your copy of the Paved Track Notebook?—The 1929 Supplement?

The International Steel Tie Co.
Cleveland, Ohio

THE UNITED RAILWAYS AND ELECTRIC COMPANY
OF BALTIMORE

CARROLL PARK SHOPS
WASHINGTON BOULEVARD
OPPOSITE CARROLL PARK

A. T. CLARK,
SUPT OF ROLLING STOCK
AND SHOPS

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576,000

MILES —*without rewinding*— *farther than a round trip to the moon or 24 trips around the world.*

In an unsolicited letter from Mr. A. T. Clark, Superintendent of Rolling Stock and Shops of the United Railways & Electric Company, he states:

"In passing through our shops the other day my attention was drawn to a Westinghouse 101-B armature in for certain repairs. Upon making closer investigation we found it had the factory winding on it. We, therefore, became interested in learning something of its history and find that since 1904, when it was first purchased, down to date it has gone over 576,000 miles without a rewinding, really a very wonderful record"

Specify Westinghouse Equipment for Lower Maintenance

WESTINGHOUSE ELECTRIC

Westinghouse

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Electric Railway Journal

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THE MAY NUMBER of ELECTRIC RAILWAY JOURNAL will contain an industry wide study of the results obtained from new cars, and an article by a nationally known engineer who has made a broad analysis of traffic signals. These are typical of the class of articles you may expect to find regularly in the new monthly Journal. Take our tip—don't miss the May number.

NEXT WEEK the first issue of *Electric Railway Journal News* will be mailed on April 6 to all present subscribers of ELECTRIC RAILWAY JOURNAL. Subsequent issues of the weekly *News* will be mailed only to those who have indicated their desire to have their subscriptions applied to include the weekly as well as the monthly publication.

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1929

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Member A.B.P. Member A.B.C.
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Golden Silence

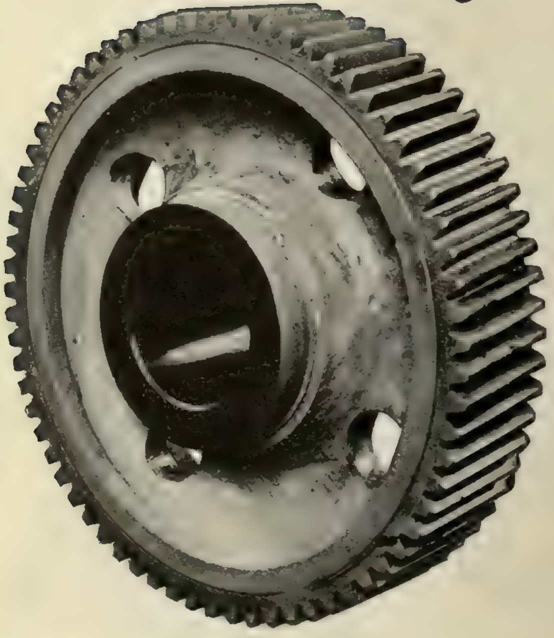
with NOISELESS GEARS

IN modern street car operation, silence is golden. Golden because it means increased good-will and greater patronage; also less outlay for repairs.

In many ways Westinghouse-Nuttall gears are proof against noise. The smooth, even load transfer of the helical design prevents chattering. Even after long service, they do not become noisy from wear because the exclusive Nuttall BP heat treatment increases the life of these gears to four times that of ordinary gears.

In addition to these silencing qualities, Westinghouse-Nuttall has developed a device which eliminates the high-pitched ringing sound characteristic of all metallic gears. This consists of a wrought iron ring built rigidly into the rim on each side of the gear, with a non-metallic layer interposed between the rings and gear rim. This is the exclusive Westinghouse-Nuttall method of eliminating noise from these gears.

Westinghouse Electric & Manufacturing Company
Nuttall Works Pittsburgh, Pa.
Sales Offices in All Principal Cities of
the United States and Foreign Countries



Westinghouse

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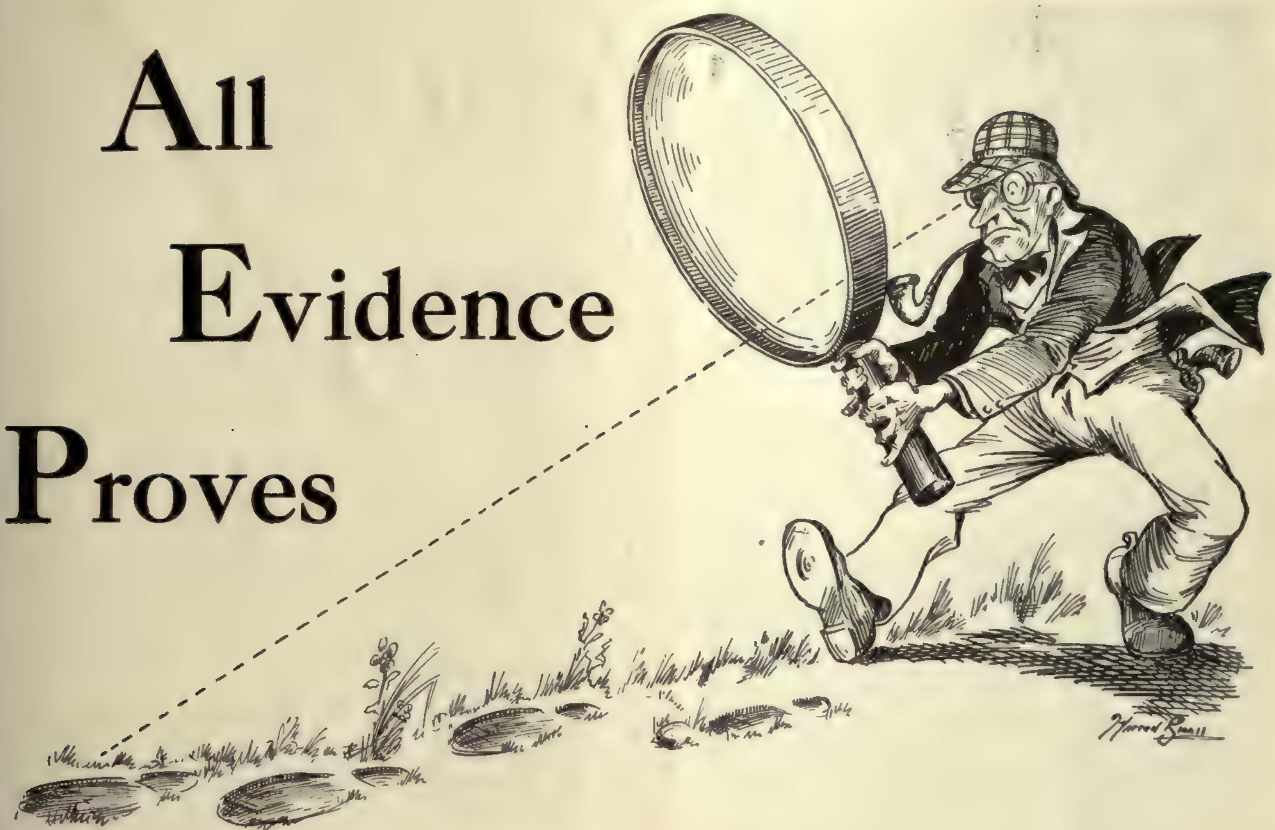
All Evidence Proves



-- *the importance of scientific application of Carbon Brushes*

THROUGH an extensive program of cooperative research, Westinghouse has made a scientific study of brushes and their relation to commutation.

As a result of this research, Westinghouse is convinced that the carbon brush is an integral part of the design of a traction motor and that, as such, it should be scientifically applied.

Westinghouse carbon brushes are being applied scientifically, thus increasing motor efficiency and reducing maintenance cost.

A Westinghouse development in Carbon Brush Application.

WESTINGHOUSE ELECTRIC & MFG. COMPANY
EAST PITTSBURGH PENNSYLVANIA
SALES OFFICES IN ALL PRINCIPAL CITIES OF
THE UNITED STATES AND FOREIGN COUNTRIES

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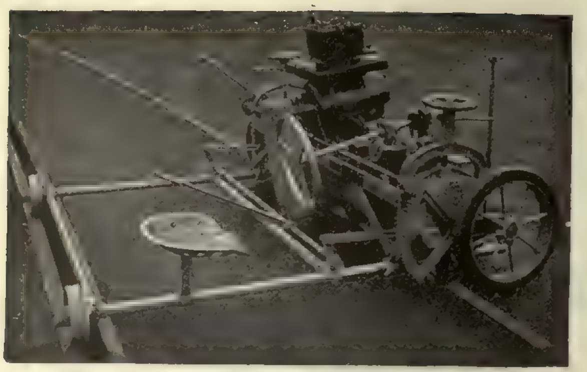
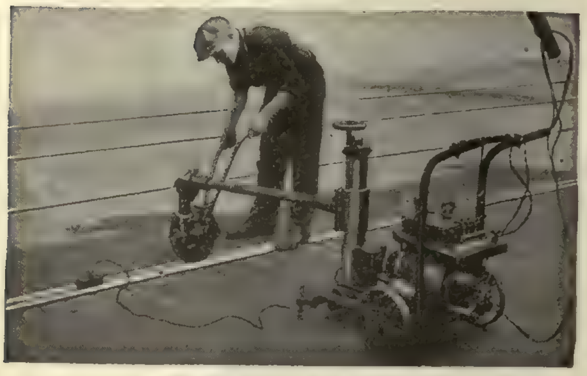
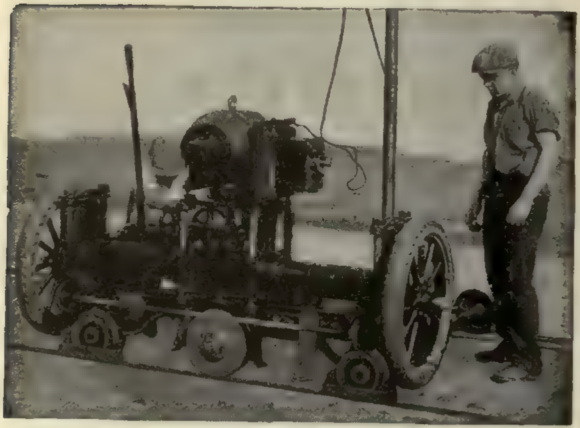
Westinghouse



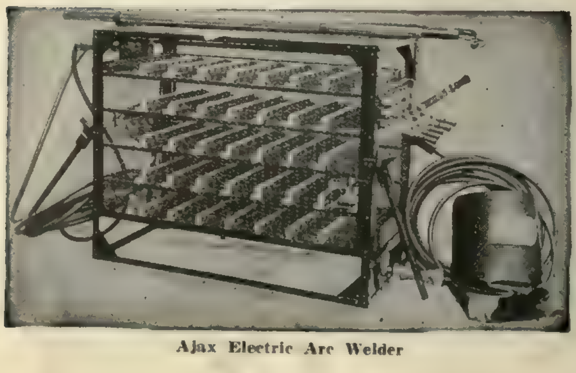
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

The road to recover

The road to recovery runs on smooth rail

—with corrugations ground out

—with joints welded and ground

—with special work welded and ground

—with curves properly lubricated

—with, in short, the sort of track any road can have economically by using the equipment pictured here.

Bulletins on these track improvers?

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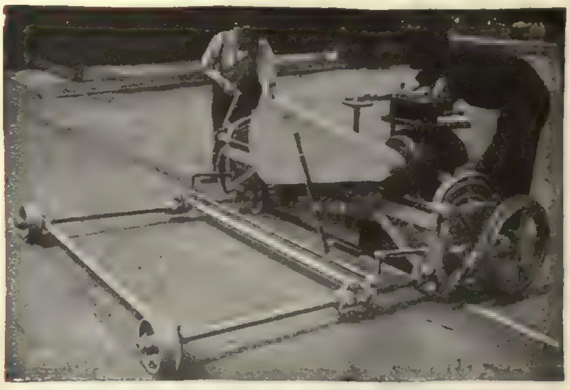
Reciprocating Track Grinder



Vulcan Rail Grinder

Midget Rail Grinder

RTW Curve Oiler

LONG life and low maintenance and replacement costs are extremely important in overhead materials. A few more months of service for a hanger—a few thousand more car passes for an ear, or splicer—a quicker, simpler method for renewing worn-out under-runs on frogs and section insulators — that is *plus*-service. *Plus*-service makes possible the practical savings that reduce operating costs and help increase the "net."

By incorporating into O-B overhead materials the elements that give *plus*-service, O-B has contributed much to better operating conditions in the electric railway industry. To further these beneficial contributions—to make sure that O-B materials continue to render *plus*-service is one of the most important endeavors at O-B.

Technical supervision; constant engineering study and development; scientific research —these safe-guard O-B quality.

Materials, processes and design are constantly studied. New devices are subjected to most severe technical tests; then to actual service trials under varying conditions, and over long periods of time. Materials at present giving satisfactory service are continually scrutinized by O-B engineers, always with the idea of adding *plus*-service to the better service the industry rightly expects from O-B materials.

In this manner O-B adds *plus*-service to all O-B materials. It is the reason why O-B materials will be found on over 600 electric railway properties in as many American cities. It is the reason your overhead requirements will be best served by O-B.

Ohio Brass Company, Mansfield Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1066L

Ohio Brass Co.

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LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

hy O-B Materials Give lus-Service

DOLLAR
AND
SENSE
INVESTMENTS

irigo Insulation Nearly twenty-five years ago
B began the manufacture of Dirigo Insulation. It
de good. Since that time Dirigo has been con-
ntly improved. Experience in the field, diligent re-
rch, laboratory and field experiments long ago
ved the excellent electrical characteristics and
h mechanical strength of Dirigo—the one balanced
ulation. Dirigo is what it is today because O-B
s-service demanded the best.

lecto Iron Time was when malleable iron became brittle when
-dipped galvanized. That was before O-B engi-
rs successfully eliminated embrittled galvanized
stings by the Flecto Iron process. Today, brittle
vanized castings at O-B simply do not happen, be-
use all are subjected to the Flecto process. The
vantage of this contribution to *plus*-service is best
oved by the hundreds of overhead superintendents,
o know, by long experience, that only Flecto Iron
n be relied upon to give maximum life in service.

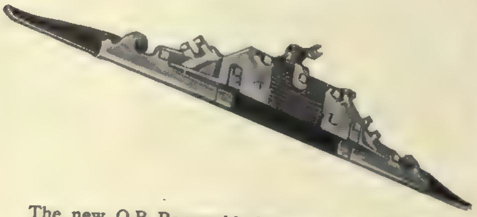
-B Bronze O-B Bronze is not just bronze. There is a mark-
distinction between ordinary bronze and bronze
de under the constant technical control in the O-B
undry. The physical properties of O-B Bronze are
verned by the particular service requirements of
ch finished product. Thus, one formula and one
tallurgical operation may suffice for one product,
ile an entirely different formula and operation may
required for another. These elements are all
der laboratory control and regulation. Here again
B renders *plus*-service through technical knowledge
service needs.

The O-B Spring Lock Hanger provides a flexible connection between ear and hanger support, yet provides a tight union between ear and hanger stud. Page 7, Supp. No. 2 to O-B Catalog No. 20.

The Marathon Ear, the outstanding trolley ear of the industry. Page 534, O-B Catalog No. 20.

The O-B Type C Splicer provides unusual wheel clearance. Wire enters in straight line, no forming being necessary. Page 542, O-B Catalog No. 20

The O-B Duplex Frog, which permits pan renewal without removal of span or trolley wires. Page 30, Supp. No. 2 to O-B Catalog No. 20.


The new O-B Renewable Underrun Section Insulator, which permits replacement of entire underrun without removing span or trolley wires. Page 26, Supp. No. 2 to Catalog No. 20.

Manufacturers of Ca

ELECTRIC SERV

Equipment for 35 YEARS

THIS company, one of the pioneer manufacturing companies supplying Electric Railway Transportation companies, notes with great interest the trend toward greater car purchases which has come with the new year.

Throughout the trials and tribulations of the industry we have never slackened our efforts to produce better products and to be of greater service. We shall continue this policy because of our faith and confidence in the industry.

We have supplied your industry with car equipment for the past thirty-five years—we have become specialists. We have honestly endeavored to supply your every need.

At the left is pictured our main plant, at 17th and Cambria Streets, Philadelphia, housing a personnel thoroughly trained by years of specialized experience. We hope that you will make every use of this plant and organization.

Keystone Car Equipment has kept abreast of the times since the beginning of Street Railway transportation and today is unsurpassed in design, material and workmanship.

E SUPPLIES CO.

SERVING the SERVICE

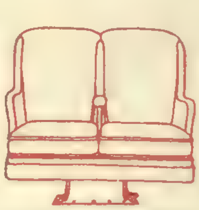
WE appreciate the responsibility imposed by years of service in the traction field. Thorough research in solving many problems has given us full understanding of the diversified needs of the field and endowed us with the facilities and knowledge to meet them. . . . When you desire to install any new equipment, or to modernize old equipment, our representatives are at your SERVICE

WESTINGHOUSE TRACTION BRAKE CO.
General Office and Works — Wilmerding, Pa.

Let's travel by this Route
they have such comfortable seats

Naturally, the modern traveller gives the preference to the most comfortable means of transportation and, other factors being equal, will choose the carrier with the most comfortable seats. Nothing is more conducive to comfort than roomy spacious seats, ideally arranged in relation to lights, windows and heat. Your traveller of today wants the same ease, the same stretching room, that he has in his own living room. And when he finds these luxuries he never forgets them.

Hale and Kilburn, for over half a century, have been catering to the tastes and comforts of passengers in every type of public carrier. And Hale and Kilburn Seating Engineers, if consulted while the car is still a project in mind, can guarantee that no other route will be given preference because of greater seating comfort.



H & K Rotating Chair No. 900
A comfortable seat for comfort loving travellers.

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"A Better Seat for Every Type of Modern Transportation Service"

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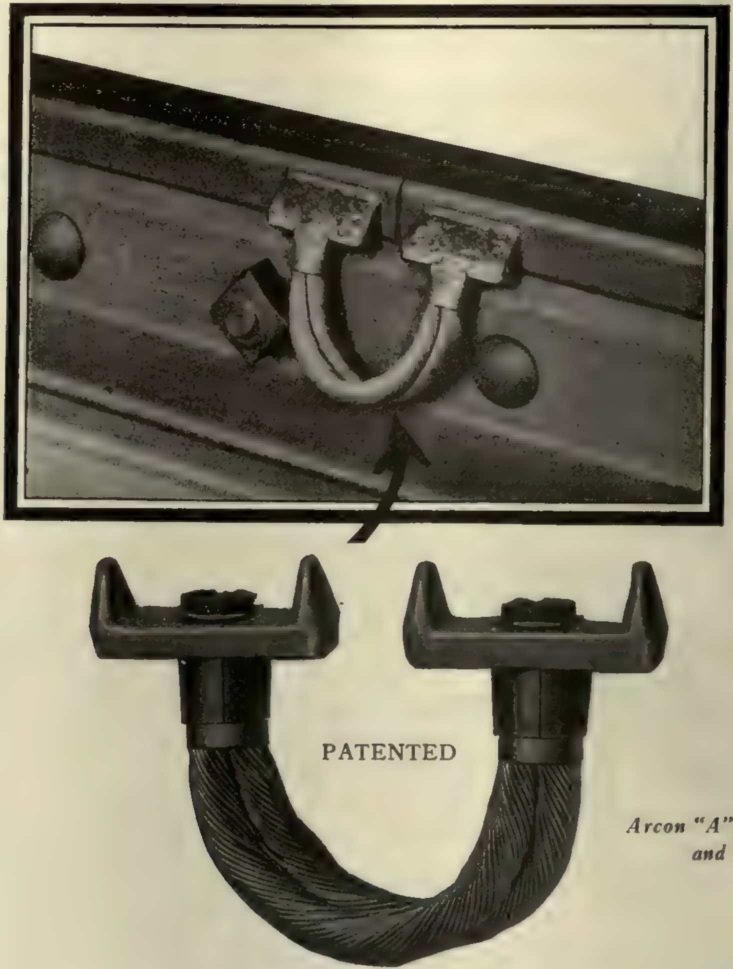

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The open terminal has many distinct advantages. All terminals provide for *easy* arc manipulation. The end of the copper conductor is approximately one-eighth of an inch from the rail, and located in an open space which insures perfect welding of the copper wires. The sloping surface of the terminal after welding is a novel and important feature in arcweld bonds.

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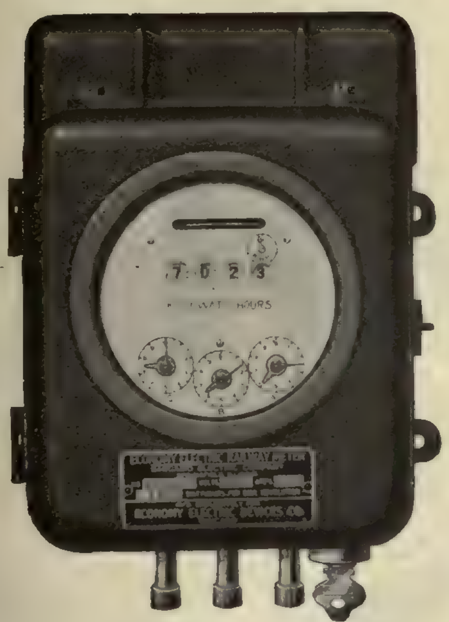

Economy Meter with Power Saving and Car Inspection Dials

ORDERS COMPLETE EQUIPMENT ECONOMY METERS WITH CAR INSPECTION DIALS

▼ ▼ ▼

The Gary Railways purchased two ECONOMY Meters in 1925. Seventeen ECONOMY Meters in 1927. Now the entire property is to be equipped with ECONOMY Meters with Car Inspection Dials. The experience with the partial equipment convinced the management that worth-while economies in energy and maintenance could be obtained and held by the use of these meters.

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There is no mystery about power-saving with Economy Meters. The Economy Meter will induce the maximum power saving with greater safety to passengers and equipment. It shows how much energy is consumed per man and per car. The records actually tell a motorman whether he has saved power—and how much.

More than 200 roads have standardized on these Rugged Time-tried Economy Devices.

After Seven Years' Use—
The President of a Large Eastern Property Says:

"These meters which are equipped with three inspection dials, known as the 'A', 'B' and 'C', have revolutionized our system of car inspection and have resulted in great economies in operating costs. They have also proved to be practically indispensable from the standpoint of power saving, great economies also having been made in this respect. Keen interest has been aroused in car operators in improving normal power consumption for various routes and progress in this respect is being constantly made."

Economy Electric Devices Company

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Sangamo Economy Watthour Meters
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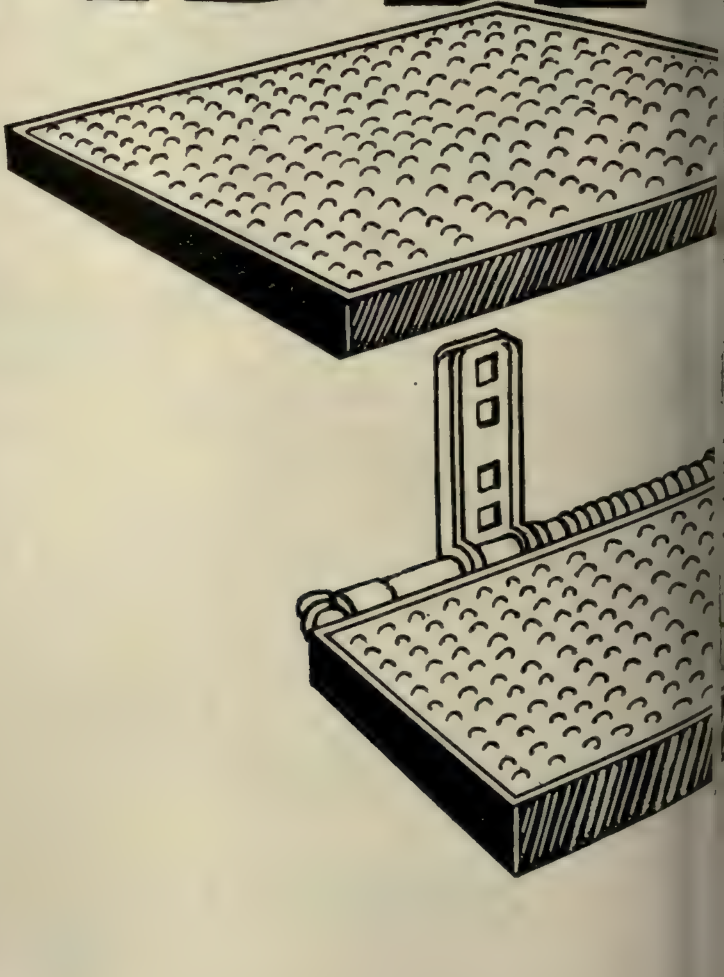
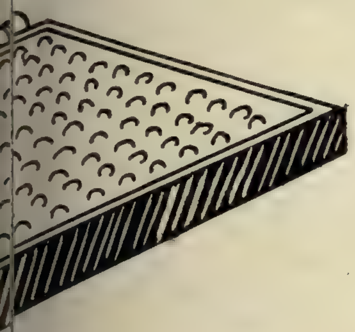
TREADLE



IZATION



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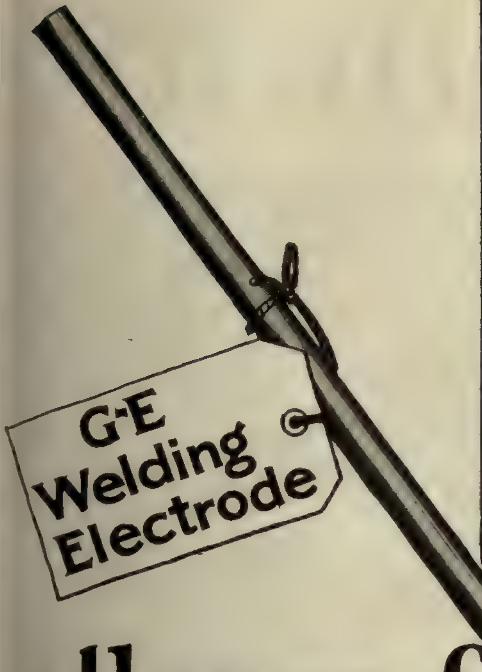
Firestone Dealers can demonstrate—clearly and quickly—how similar economies can be applied to your own business, whether you operate a large fleet or a single vehicle. The Firestone Dealer knows tires. His men are factory trained. His equipment is modern and complete. And his *Proposal of Service* will show you how to make your business more profitable by lowering the overhead on your haulage costs—by giving you "Most Miles per Dollar." Get in touch with your nearest Firestone Dealer or Firestone Branch office for further particulars.

Firestone Dealers can save you money and serve you better

Firestone

Gum-Dipped Truck and Bus Tires



allows for shrinkage

A large street railway company reports that it has found G-E Type "A" welding electrode invaluable for the reconditioning of cast-iron gear cases, which sometimes crack under severe service.

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550-502

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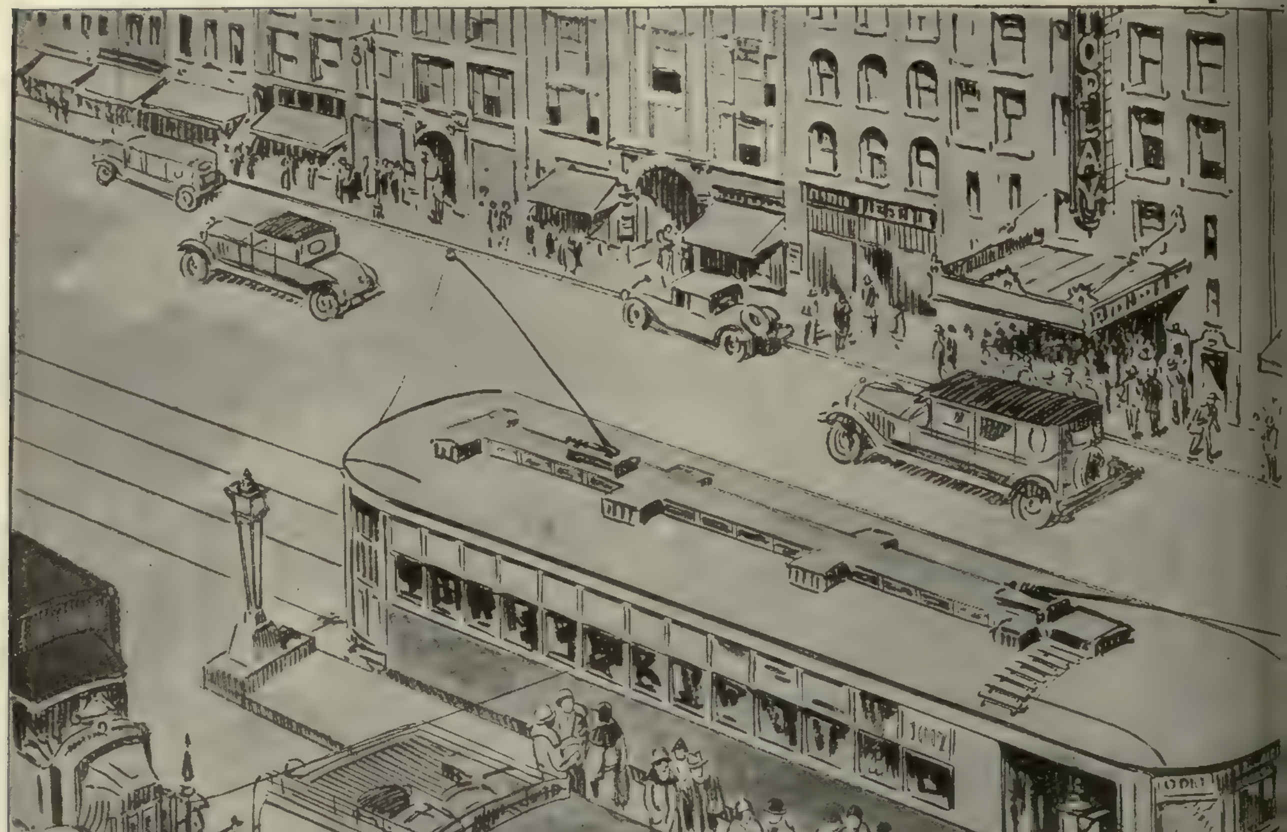

GENERAL

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You, as a manufacturer, must look well to your methods if you are to produce a commodity that your patrons will accept—if producing and marketing this commodity is to bring a profit.

You can not hope to do either if you operate a slow, infrequent schedule with obsolete equipment over rough tracks, or if you fail to coördinate the modern tools of your industry—cars, buses, trolley buses, perhaps taxicabs—in a complete and flexible system.

The electric railway has learned its lesson. Now, enlightened executives are doing all in their power to replace obsolete cars, to speed service, to improve tracks, to install economy-producing equipment and material in the maintenance shop.

For this awakened industry, General Electric will continue to invest its resources in the development of increasingly better transportation equipment. It is advancing with the times in its contributions to this as to every other major industry.

THE GENERAL ELECTRIC HOUR IS BROADCAST EVERY SATURDAY EVENING, 9 TO 10 E.S.T., OVER AN N.B.C. COAST-TO-COAST NETWORK.

330-127

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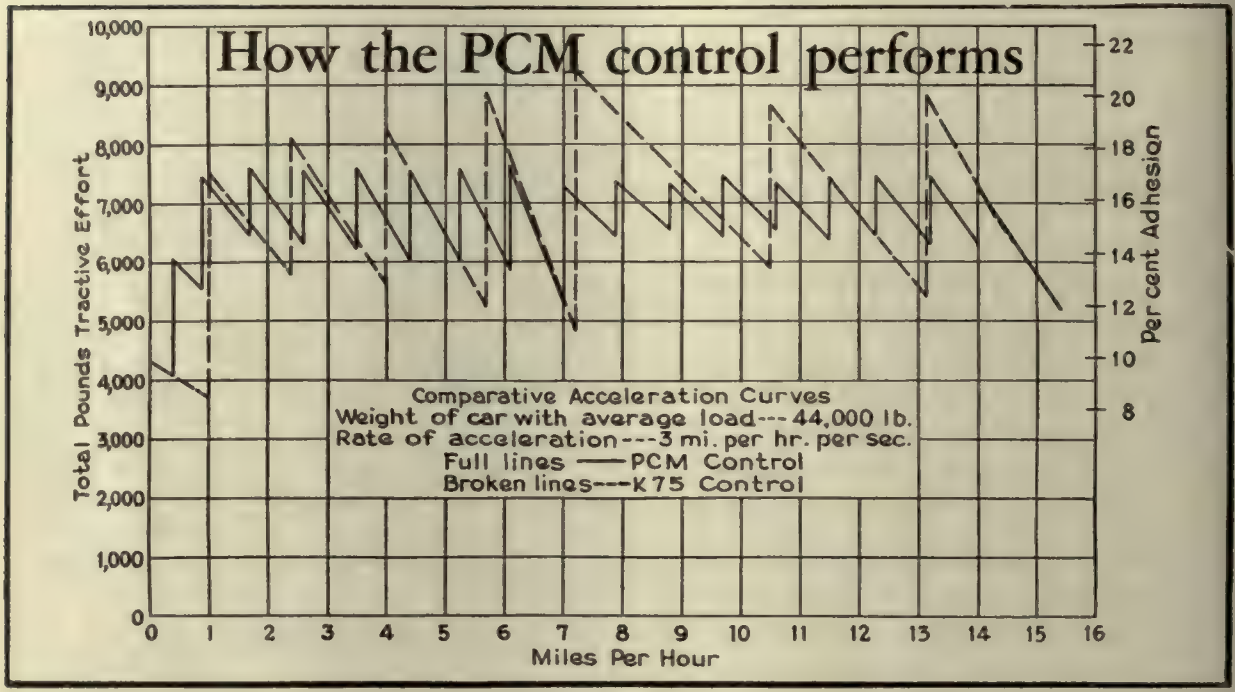
Keeping Ahead of Traffic PCM control for fast, smooth acceleration



IF fast schedules are to be maintained, the cars must keep ahead of traffic at the "go" signal. The necessary fast acceleration, at least 3 mi. per hr. per sec., is practical only if it is smooth—free from jerking and jolting.

The new PCM control is used for just this service. Its eighteen points give the car a rapid acceleration with a smoothness not heretofore attained. Automatically operated, it does not require a skillful operator, since sliding over points is impossible.

The curve shows how the slight variation in tractive effort permits operation close to the slipping point of the wheels.

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GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of
Street Railway Journal and Electric Railway Review

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James H. McGraw, *Chairman of the Board*
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CHARLES GORDON, *Editor*

Louis F. Stoll,
Publishing Director

Volume 73 New York, April, 1929 *Number* 13

Leadership Requires Perspective

UNDER the pressure of daily activities, there is always danger that attention may become so focused upon routine details as to lose sight of major objectives; that the distinction between the means and the end may become obscured. An enterprise which loses sight of its primary objectives is like a ship without a pilot. So also is an industry which fails to establish a chart of sound principles by which to judge whether it is moving ahead on a definite course or merely drifting with currents of opinion and the tide of circumstances. Of course, even without policies established or principles determined, circumstances and exterior forces may combine to bring about considerable success when results are measured only in immediate profits. But without adequate soundings to guide them through dangerous channels, and without the vision of capable leadership, many businesses have all too soon found themselves upon the shoals of economic desperation.

THERE is more group thinking in business today than ever before, and never has there been keener appreciation of the importance of leadership. In the local transportation industry, growing realization of this need has been manifested during recent months by a persistent demand for a better understanding of fundamentals. There is less inclination today to drift with the tide of events than at any time in the past decade. There is less readiness to be guided by opinion or to be satisfied with expedients which promise only temporary relief. There is a growing demand for a clearer understanding of transportation economics. An effort is being made to develop a clearer understanding of the economic interrelation between transportation and the community itself.

Experience has indicated that the huge costs of rapid transit facilities cannot be carried by operating revenues at any reasonable rate of fare, if service is to be maintained at modern standards of comfort and convenience. Furthermore, transportation men are beginning to understand that it is not alone sufficient that rapid transit construction costs be borne by the community. The method of financing is equally important. Most of those who have given the matter intensive study have become convinced that property values created by transit construction should supply the funds for the structure and right-of-way, for after all a new transit line is merely a special form of street or highway. If this principle applies to rapid transit why should it not likewise apply to rail lines laid in the street itself for public transportation? When some of these fundamentals are considered, there are presented new fields of research and study that indicate how little, after all, is known of the fundamentals of this business which plays so important a part in the life of the modern community.

BUT the need for more fundamental thinking in the industry is not limited alone to broad questions of management and economics. It is important likewise that each principal department maintain its own perspective and sense of proportion. Whether the direct responsibility be operation or maintenance; and whether the latter be the maintenance of equipment or track or buses or electrical system, the distinction between problems of daily routine and broad problems of departmental policy is important. The department head who, though he be ever so capable a technician, loses sight of the broader objectives of the industry, and of the relation between his own work and that of associated departments, is headed toward ultimate difficulty.

This issue of ELECTRIC RAILWAY JOURNAL indicates in a striking way the fact that electric railway maintenance executives are alert to the needs of the times and are themselves engaged in critical analysis of methods and previously accepted precedents. In all four departments of electric railway maintenance—track, equipment, distribution system and buses—current practices and methods are being examined with a critical eye. There is a demand for performance and efficiency transcending former accepted standards. There is a frankness in discussion, a freedom in the interchange of information between properties and an open-minded attitude toward the other man's methods, that promises accelerated improvement and progress.

A GREATER tendency exists today than for many years in the past to emphasize the objectives as well as the methods of maintenance. This has resulted in a radically changed concept of the maintenance departments' work. The old idea of repair after failure is being superseded by the modern policy of preventive maintenance. This has been proved to be good business not only from the standpoint of avoiding service interruptions, but from the standpoint of economy as well. The rapid progress that has been made on many properties toward this modern concept indicates that the alert maintenance executive is maintaining his perspective, thereby proving his right to leadership.

Maintenance Achievement Worthy of Emulation

HAD anyone said ten years ago that it would be possible to keep street cars in service for more than 20,000 miles without a pull-in he would have been considered a dreamer. And had he asserted that this could be done not once, but kept up for six years as the average on four leading properties, it would have been considered preposterous. Then add that while making such a record the railways participating would save $2,000,000 in the maintenance of equipment, and he would have been branded a fool.

Yet this is the record achieved by member companies of the Electric Railway Association of Equipment Men, Southern Properties. The association, formed more than six years ago, has had as its object the improvement of performance and the reduction of costs. That it has been successful in this is proved by the figures quoted. It is the more remarkable that the record was made in a period when costs of labor were rising and prices of materials remaining at or near the post-war maximum.

There are other properties that have made comparable improvements in keeping equipment in service and in reducing maintenance costs. But the work of this association is remarkable in that these results have been achieved not by one company alone, but by a group of properties in a widely scattered territory. The accomplishment is worthy of the highest praise. And what is more, it is worthy of emulation the country over.

Chromium Plating Has Many Uses

NEW uses of chromium plating merit careful investigation by electric railways. The most extensive present application is its use instead of nickel for the finish of radiators, headlights, and other exterior fittings of automobiles. In this field it is proving of advantage particularly for its freedom from tarnish. Following along this line it should prove of advantage for the finish of car fittings such as grab handles, stanchions, window catches, window guards, etc.

But in addition to its use as a decorative finish, the great hardness and wear-resistant properties of chromium are leading to its use for finishing surfaces that are subject to wear. Its principal mechanical application so far has been on measuring devices, such as plug gages; snap gages; drawing, stamping and forming dies; jig bushings, etc. For such uses it is applied in thicknesses of 0.002 in. to 0.004 in.

Chromium should prove valuable as a bearing surface because of its low coefficient of friction and its resistance to abrasion and chemical action. This last characteristic permits the use of certain oils that are efficient lubricants but which have been limited in use during the past because of their acid content that attacks most metals. For bearing surfaces, chromium can be applied satisfactorily in thicknesses up to 0.015 in. In repair work it may prove useful for building up worn surfaces where the wear is very slight, such as the outside surfaces of armature and axle bearings, housing fits, etc. Its use in this field up to the present has been entirely experimental.

Another application which promises to be of interest to electric railways is in providing a wearing surface for such parts as gears, brake cylinders, pistons, coupler faces, door operators, etc. Chromium is applied by plating. To get good adherence to the base metal the part being plated must be cleaned perfectly. The extreme brittleness of chromium accounts largely for the tendency of relatively thick deposits to chip when subjected to impact. The relative coefficients of thermal expansion of chromium and the base metal upon which it is applied determine largely its adherence when subjected to any great change in temperature. The expansion of chromium under temperature change is similar to that of glass and platinum but is much less than that of iron, copper, nickel and zinc. Results obtained from the experimental uses of chromium plating vary greatly, but its possible applications by electric railways certainly merit careful consideration and investigation.

Properly Designed Records Guide Future Practice

TO GAIN a true insight into any branch of maintenance work by an electric railway it is necessary to have properly detailed records. All companies keep records of their various activities—in fact, most of them actually keep too many—but in every department numerous records may be found that merely require valuable space for filing and which serve no useful purpose. The big problem, therefore, is not necessarily to create new classifications and forms to increase the number, but to choose those which will be of the most benefit in analyzing costs, in determining which products are giving the best service, and in apportioning material and labor to obtain the highest efficiency and least wastage in repair work. It is a real problem and one that requires careful thought and study over a long period of time.

A few railways have departed from the easy and usual methods of recording maintenance details and the results attained on these properties are convincing proof that it is worth while. An excellent example of what can be accomplished is afforded in the experience of the New Orleans Public Service, Inc., whose methods of recording track maintenance costs are described elsewhere in this issue. The company classifies all of its trackage according to the type and age of construction, and keeps accurate records of all expenditures for each section. These figures are so compiled that an intelligent analysis of the various track designs and maintenance methods can be made. The company also has adopted a system of inspection reports which is used in assigning repair work. They are particularly helpful in apportioning the proper amount of materials and the proper number of men to each repair job.

Track maintenance, however, is only one of four major maintenance activities. Cars, buses and overhead all require heavy and continuous expenditures for materials and labor. To determine which tires give the best service on buses it is necessary to have records that tell the full story of the conditions to which each tire was subjected and its service history. Likewise, records of cars and buses, railway motors, armatures, trucks, compressor equipments, controllers and other parts, should all be designed for the ready comparison of performance and cost, and to serve as a guide in determining future purchases and maintenance policies.

Although fewer records are being kept today than were maintained in the past, there is no need for increasing the number. As a matter of fact, when fewer records are kept, closer attention can be paid to each, with resulting greater usefulness. The important thing in setting up records is to make them more than a history of what has occurred. Each record should have as its ultimate purpose the improvement of future practice on the basis of past experience.

Adequate Bus Maintenance Facilities Are a Good Investment

OPERATION of buses by electric railways has expanded rapidly in recent years, but in many instances this expansion has occurred without any definite forethought. Consequently it is not surprising to find that adequate maintenance facilities have not always been provided. Many garages are simply converted carhouses. Such buildings usually are far from ideal places for doing bus maintenance and repair work. Because of the use of internal combustion engines for buses the problem of ventilation in a garage is entirely different from that in a carhouse. So also are the pit requirements, as most of the heavy parts can be lowered from the underside of a car while they must be removed by lifting from the chassis of a bus. In other ways also, an old carhouse is not entirely satisfactory for bus maintenance work.

In the matter of machine tools the present status of electric railway garages shows signs of unplanned development. Many are poorly provided with equipment, considering the number of buses operated. Apparently this is the result of a recent increase in the number of vehicles without a corresponding increase in maintenance facilities. Need for economy undoubtedly is the reason for these conditions. But despite the compelling force of this necessity, the fact must not be lost to sight that in the long run the provision of adequate maintenance facilities always proves to be the most economical policy.

That the truth of this is recognized by many progressive managements is clearly shown by the information gathered in a survey including 41 of the largest electric railway bus operating companies in the United States and Canada, a summary of which appears elsewhere in this issue. While some companies have been compelled to follow the policy of using old carhouses for garage purposes, the majority opinion is strongly in favor of buildings especially designed for the purpose and provided with ample maintenance equipment and tools to insure expert workmanship and real efficiency.

A Distinction Between Information and Propaganda Is Accuracy

ELEGANCE of expression is always to be desired, but no phrase other than "How do they get that way?" appears to fit the case of the Florida Public Utility Information Bureau in its discussion in its bulletin of Feb. 25 of the subject "Street Cars or Buses in Jacksonville." That city is in the throes of growing pains. It needs more transportation. The disposition of the Jacksonville Traction Company appears to be to give the citizens what they most desire, more service by bus or street car. It favors bus service to the outlying districts. This is the progressive attitude where density of traffic and prospective business do not warrant the building of street railway lines, but the information bureau appears to be taking upon itself a great responsibility when it proclaims through its bulletin that "the company does not want to lay double tracks on Main Street to clutter up the landscape, interfere with auto service and parking." So street cars interfere with parking. Since when? The general impression among railway men and many others was that parking interfered with the street cars. But that isn't all. According to the Florida sage, "double-tracking on a busy street is out of date, handicaps modern transportation and demonstrates lack of knowledge of modern ideas." The JOURNAL stands second to none in its enthusiasm for the bus. It is not disposed to enter again here into a discussion of the economics of various forms of transportation or of the economics of the use of the streets. It would be easy to correct charitably authors not properly informed who make statements of this kind about such matters, but the Florida Bureau should be in a position to know better. Regardless of the objective it may have in mind for Jacksonville, this statement is both a misrepresentation and an exaggeration.

The Association's Loss Is Baltimore's Gain

FOUR years ago Lucius S. Storrs was chosen managing director of the American Electric Railway Association. It was a new office, but Mr. Storrs' contact with association affairs had extended over the years and he was in thorough sympathy with the objectives for which the Advisory Council was formed. The industry needed leadership. Most of its problems were generally to many properties and there was need for group thinking and organized attack on common difficulties.

There have been no heroics in the conduct of the affairs of the association under Mr. Storrs, but there has been steady progress in the creation of greater group consciousness among electric railways and in the stimulation of the interchange of ideas, methods and information between properties through the medium of the association. In Mr. Storrs, the industry has had a national spokesman on questions of taxation, legislation and relations with other industries—activities the value of which are not readily apparent unless the results are viewed collectively. As for the individual properties, there have been available to them, in addition, the personal services of the association staff.

In his new post as executive chairman of the board of the United Railways & Electric Company of Baltimore, Mr. Storrs takes the leadership of an individual property. His advice will still be available in the councils of the association. In addition, he may be expected to apply in Baltimore the policies which he has advocated for the industry, and through demonstration of their efficacy he will continue to help in guiding the industry. Mr. Storrs assumes his duties in Baltimore with an enviable record of achievement in management. It was largely his accomplishments as president of the Connecticut Company that led to his selection as managing director of the association. From that post he takes with him a still broader outlook and understanding of transportation fundamentals.

If the citizens of Baltimore are expecting the spectacular from Mr. Storrs they are doomed to disappointment. But if they are prepared for that gradual upbuilding which is the result of the most careful study and deliberation and is the sign of permanence, they may expect their patience to be rewarded. The present management of the United Railways & Electric Company welcomes Mr. Storrs' leadership. If the JOURNAL is correct in its conceptions of Baltimore and its transportation problem, he may be expected to initiate a program that will redound to the mutual and permanent advantage of the community and the security holders of its transportation system.

Four Southern Properties

Save $2,000,000 in Equi

By

G. C. HECKER

Special Engineer American Electric Railway Association

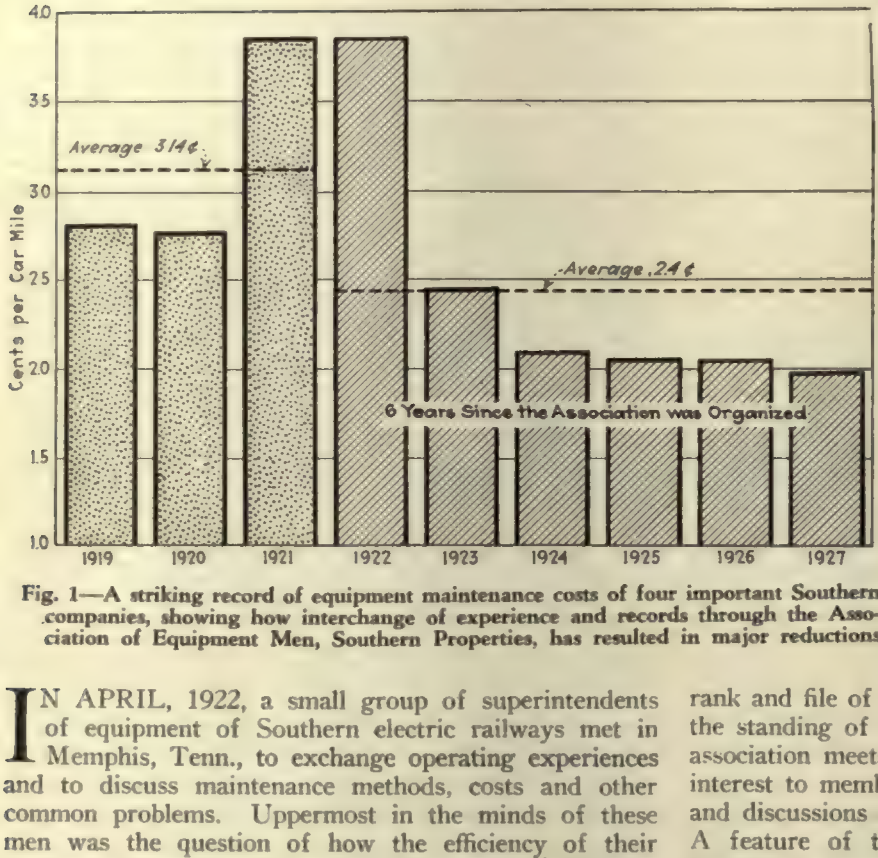


Fig. 1—A striking record of equipment maintenance costs of four important Southern companies, showing how interchange of experience and records through the Association of Equipment Men, Southern Properties, has resulted in major reductions

IN APRIL, 1922, a small group of superintendents of equipment of Southern electric railways met in Memphis, Tenn., to exchange operating experiences and to discuss maintenance methods, costs and other common problems. Uppermost in the minds of these men was the question of how the efficiency of their mechanical departments could be increased. During the meeting a comparison of operating costs and car failure records paved the way for an animated discussion of inspection and maintenance methods, which brought to light many divergent opinions and many interesting practices.

As the discussion continued the conviction grew among those present that this frank interchange of information and ideas had been extremely helpful and that each man had benefited greatly by it. It was agreed unanimously that regular interchange of maintenance data and costs and the periodical discussion of this information would provide a means of creating a spirit of friendly competition among the mechanical departments which would inevitably result in each one striving to improve its performance and its relative standing in the group. Before adjourning this group organized the Electric Railway Association of Equipment Men, Southern Properties, the charter members representing the mechanical departments of the properties in Birmingham, Nashville, Knoxville, Little Rock, Dallas, New Orleans, Mobile, Atlanta and Memphis.

Each member furnishes the secretary his monthly maintenance of equipment costs and his record of car failures, or pull-ins. In order to secure uniformity in the pull-in records, the association established the following definition for the guidance of the members:

> A car which has to be removed from service prior to completion of its regular prescribed run for any mechanical, electrical or man failures or accident, is termed a "pull-in."

These figures are compiled each month by the secretary and are printed and distributed to all members of the association. Not only are these data available to the department heads and supervisory forces for study, but they are posted in the shops and carhouses so that the rank and file of the employees on each property can see the standing of their own company in the group. The association meets semi-annually to discuss questions of interest to members and for the presentation of papers and discussions on timely shop and equipment subjects. A feature of these gatherings is the inspection trip through the shops and carhouses of the property in the city where the meeting is being held.

It is now seven years since the association was organized. Has it justified its existence? Did it result in any real accomplishment? The answers to these questions should be found in the maintenance records of these properties. With that thought in mind the writer has compiled and studied data furnished by four large companies represented in the charter membership of the association, viz., Memphis, Atlanta, Birmingham and New Orleans. A larger group would have been included in the study had it been possible to obtain continuous records, both prior to and since the organization of the association. As such figures were not available for all of the nine companies represented in the charter membership, the study has been confined to the above-mentioned companies.

The accompanying table shows the combined figures of these four properties. For the three years prior to the formation of the association, the combined main-

ent Maintenance

During Six Years

FREE INTERCHANGE of cost records, comparison of methods and critical self-analysis resulting from the activities of the Association of Equipment Men, Southern Properties, have brought about improved maintenance performance which has attracted widespread attention. A consolidated study of the records of four companies — at Memphis, Atlanta, Birmingham and New Orleans —gives a striking summary of the results accomplished.

tenance of equipment costs averaged 3.14 cents per car-mile. For the first six years of the existence of the association, these costs averaged 2.4 cents per car-mile, a decrease of 23½ per cent. Fig. 1 shows that since 1922 there has been a consistent, steady downward trend in maintenance costs. Comparing the 1927 cost with the year just before the association was formed, we find a maximum reduction of 49 per cent.

In order to translate the accomplishments of the mechanical departments into dollars and cents, the average reduction in maintenance cost per car-mile during the six years from 1922 to 1927 has been multiplied by the average car-miles operated during the same period. This shows an annual saving of roughly $350,000 per year, or for the six-year period approximately $2,100,000. Comparing the average cost for the three years prior to the formation of the association with the 1927 cost, we find that the maximum annual saving has been roughly $556,000.

COMBINED STATISTICS OF MECHANICAL DEPARTMENTS AT MEMPHIS, ATLANTA, BIRMINGHAM AND NEW ORLEANS

Year	Maintenance of Equipment Cents per Car-Mile*	Pull-ins Due to Equipment Failures	Car-Miles per Pull-in	Car-Miles Operated	Cars Operated	Carhouse and Shop Employees	Motor Cars Purchased
1919	2.8	15,000	3,300	49,396,000	†	841	35
1920	2.759	15,700	3,200	50,421,000	†	971	30
1921	3.864	12,632	3,900	49,385,000	1,259	1,019	45
Average of above three years	3.141	14,477	3,457	49,725,000	....	943	37
1922	3.825	6,028	7,720	46,554,000	1,234	911	100
1923	2.399	3,425	14,100	48,479,000	1,244	944	40
1924	2.118	2,388	20,100	48,401,000	1,251	872	103
1925	2.048	1,955	24,100	47,185,000	1,266	764	100
1926	2.050	1,579	30,300	47,838,000	1,286	745	118
1927	1.976	1,566	30,500	47,778,000	1,291	737	40
Average of above six years	2.403	2,824	21,133	47,706,000	1,263	829	83

*Depreciation not included. Maintenance costs include standard accounts 29—41 inclusive.

†Complete figures were not available.

Fig. 2 shows the record of car failures. These are the pull-ins due only to equipment failures and do not include those due to man failures nor accidents. During the first six years of the existence of the association the average number of pull-ins for the four properties was approximately 2,800 as compared with an average of 14,500 for the three previous years, or an average reduction of 77½ per cent. Car failures, like maintenance costs, have been reduced steadily until in 1927 the pull-ins were only 1,566. Compared with the year 1921, this is a maximum reduction of 87½ per cent in car failures due to mechanical or electrical defects.

In order to permit comparisons with other properties, this car failure record has been converted in Fig. 3 to "car-miles operated per pull-in." It will be observed that the car-miles per pull-in have been increased steadily from approximately 3,500 to 30,500. The average miles prior to 1922 were 3,457. The average for the six years following the organization of the association was 21,133.

The average daily cars operated on the four properties during the years 1922 to 1927 inclusive totaled 1,263. Thus it will be seen that the car failures have been steadily reduced until during the year 1927 there were about 1¼ failures per car operated. Here is a record of splendid achievement. How are we going to account for the reduced maintenance costs and the improved performance of equipment, which began almost simultaneously with the organization of this association?

Obviously, not all of this splendid improvement in performance can be attributed to the activities of the association, as there are many other factors which may influence the maintenance costs and the car failures. Among these might be mentioned the new cars purchased

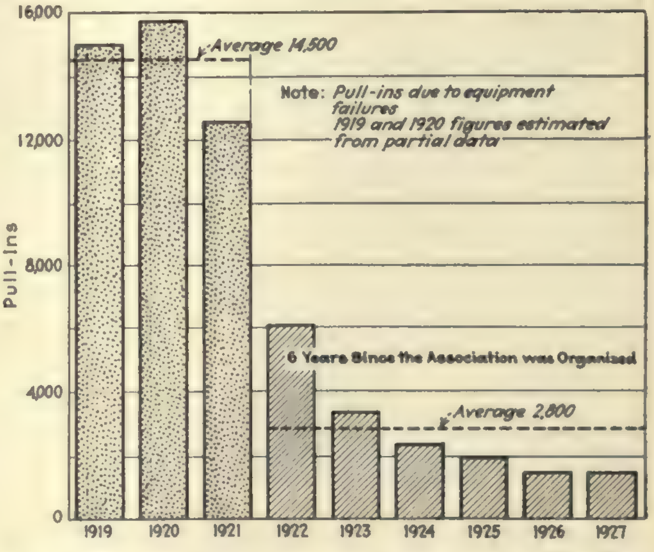
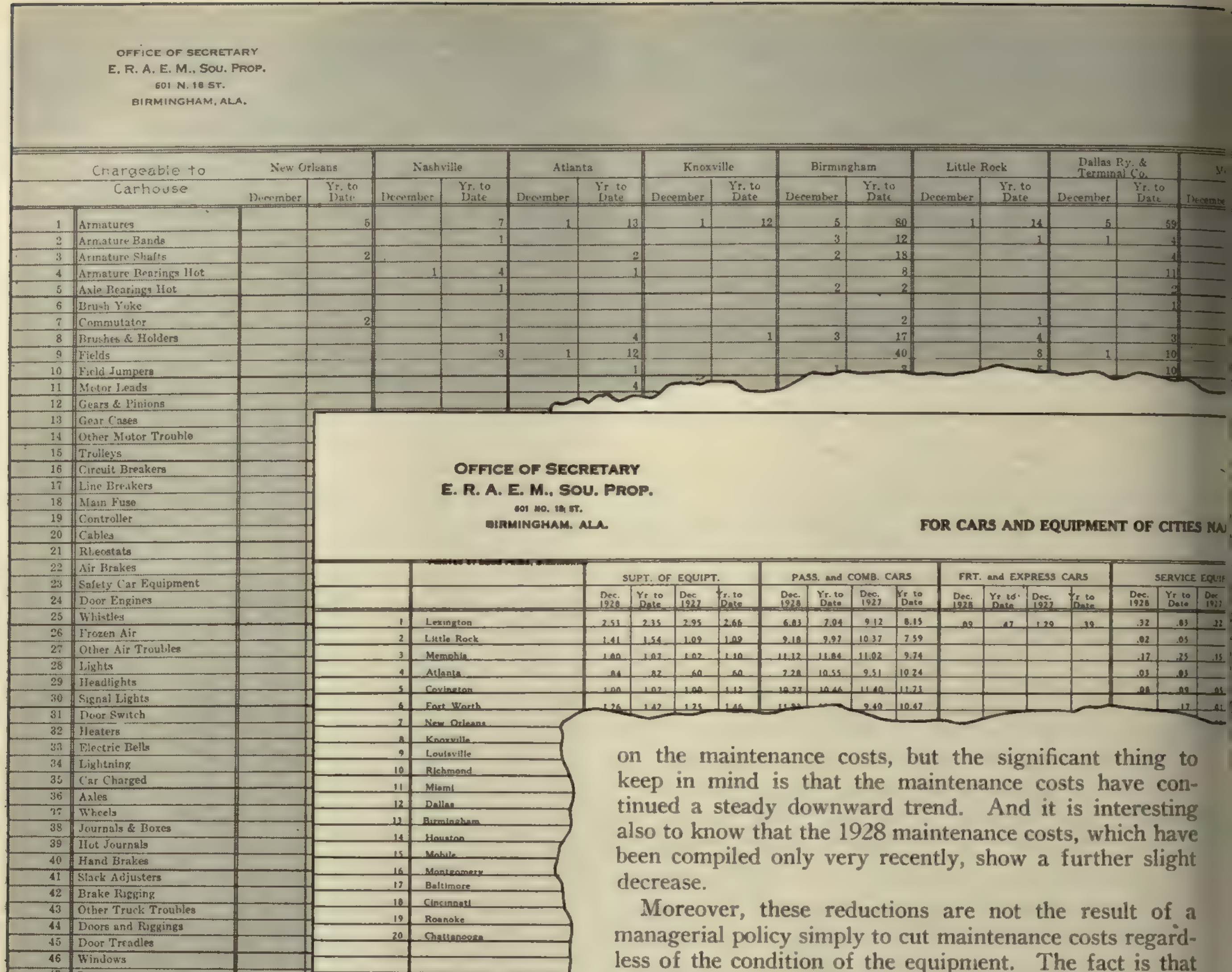


Fig. 2—Steady reductions in pull-ins for mechanical failures indicate that the standards of maintenance were being raised while costs were being reduced. This chart is compiled from the combined figures for Memphis, Atlanta, Birmingham and New Orleans



OFFICE OF SECRETARY
E. R. A. E. M., SOU. PROP.
601 N. 18 ST.
BIRMINGHAM, ALA.

	Chargeable to Carhouse	New Orleans		Nashville		Atlanta		Knoxville		Birmingham		Little Rock		Dallas Ry. & Terminal Co.	
		December	Yr. to Date	December	Yr. to Date	December	Yr to Date	December	Yr. to Date	December	Yr. to Date	December	Yr. to Date	December	Yr. to Date
1	Armatures		5		7	1	13	1	12	5	80	1	14	5	59
2	Armature Bands				1					3	12		1	1	4
3	Armature Shafts		2				2			2	18				4
4	Armature Bearings Hot			1	4		1				8				11
5	Axle Bearings Hot				1					2	2				2
6	Brush Yoke														1
7	Commutator		2								2		1		
8	Brushes & Holders				1		4		1	3	17		4		3
9	Fields				3	1	12				40		8	1	10
10	Field Jumpers						1								10
11	Motor Leads						4								
12	Gears & Pinions														
13	Gear Cases														
14	Other Motor Trouble														
15	Trolleys														
16	Circuit Breakers														
17	Line Breakers														
18	Main Fuse														
19	Controller														
20	Cables														
21	Rheostats														
22	Air Brakes														
23	Safety Car Equipment														
24	Door Engines														
25	Whistles														
26	Frozen Air														
27	Other Air Troubles														
28	Lights														
29	Headlights														
30	Signal Lights														
31	Door Switch														
32	Heaters														
33	Electric Bells														
34	Lightning														
35	Car Charged														
36	Axles														
37	Wheels														
38	Journals & Boxes														
39	Hot Journals														
40	Hand Brakes														
41	Slack Adjusters														
42	Brake Rigging														
43	Other Truck Troubles														
44	Doors and Riggings														
45	Door Treadles														
46	Windows														
47	Seats														
48	Steps														
49	Registers														
50	Signs														
51	Gongs														
52	Sand Rigging														
53	Fenders														
54	Draw Bars														
55	Snow Scrapers														
56	Other Body Troubles														
57	Unclassified														
58															
59															
	Total chargeable to equip.	0	2												
	Total Car Miles	1,140,836	13,605,1												
	Average Pull-Ins Per Day	.0													
	Average Mi. Per Pull-In	1,140,836	544,												
	Not Chargeable to Carhouse														
60	Accidents	4	3												
61	Split Switches														
62	Derailments		5												
63	Doors and Steps														
64	Broken Glass														
65	Trouble Reported, None Fd.														
66	Unclassified														
67															
	Total not chargeable to equip.	4													
	Avg. Pull-Ins Per Day	13													
	Avg. Mi. Per Pull-In	285,269	170,0												
	Total Pull-Ins	4	10												
	Total Avg. Pull-Ins Per Day	11	2												
	Total Avg. Mi. Per Pull-In	[illegible]	[illegible]												

OFFICE OF SECRETARY
E. R. A. E. M., SOU. PROP.
601 NO. 18 ST.
BIRMINGHAM, ALA.

FOR CARS AND EQUIPMENT OF CITIES NA

		SUPT. OF EQUIPT.				PASS. and COMB. CARS				FRT. and EXPRESS CARS				SERVICE EQUIP		
		Dec. 1928	Yr to Date	Dec 1927	Yr. to Date	Dec. 1928	Yr. to Date	Dec. 1927	Yr to Date	Dec. 1928	Yr to Date	Dec. 1927	Yr to Date	Dec. 1928	Yr to Date	Dec 1927
1	Lexington	2.53	2.35	2.95	2.66	6.83	7.04	9.12	8.15	.09	.47	1.29	.19	.32	.83	.22
2	Little Rock	1.41	1.54	1.09	1.09	9.18	9.97	10.37	7.59					.02	.05	
3	Memphis	1.00	1.07	1.02	1.10	11.12	11.84	11.02	9.74					.17	.25	.15
4	Atlanta	.84	.82	.60	.60	7.28	10.55	9.51	10.24					.03	.03	
5	Covington	1.00	1.07	1.00	1.12	10.77	10.46	11.40	11.73					.08	.09	.05
6	Fort Worth	1.26	1.42	1.25	1.46			9.40	10.47						.17	.01
7	New Orleans															
8	Knoxville															
9	Louisville															
10	Richmond															
11	Miami															
12	Dallas															
13	Birmingham															
14	Houston															
15	Mobile															
16	Montgomery															
17	Baltimore															
18	Cincinnati															
19	Roanoke															
20	Chattanooga															

since 1921, the fluctuations in wages and in material prices and the general managerial policy with respect to the maintenance budget.

From 1919 to 1927, inclusive, these four companies purchased 611 new motor cars. In 1919, 1920 and 1921 an average of 37 motor cars per year were purchased, this being approximately 3 per cent of the total cars operated. From 1922 to 1927, inclusive, the average number of cars purchased annually was 83, or approximately 6.6 per cent of the total cars operated. Undoubtedly, the increase in the number of new cars placed in service each year has had some effect on the maintenance costs, but the significant thing to keep in mind is that the maintenance costs have continued a steady downward trend. And it is interesting also to know that the 1928 maintenance costs, which have been compiled only very recently, show a further slight decrease.

Moreover, these reductions are not the result of a managerial policy simply to cut maintenance costs regardless of the condition of the equipment. The fact is that the rolling stock on these properties is maintained in excellent condition. Its appearance testifies to the high standard of maintenance, and if appearance is not sufficiently conclusive the records of car failures should be

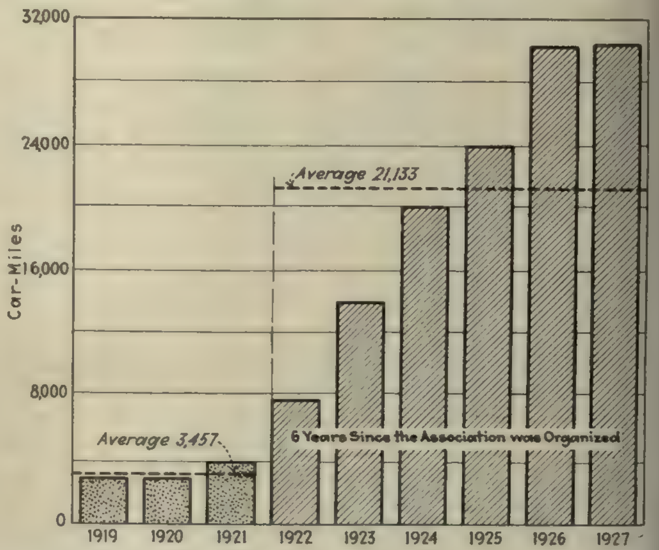
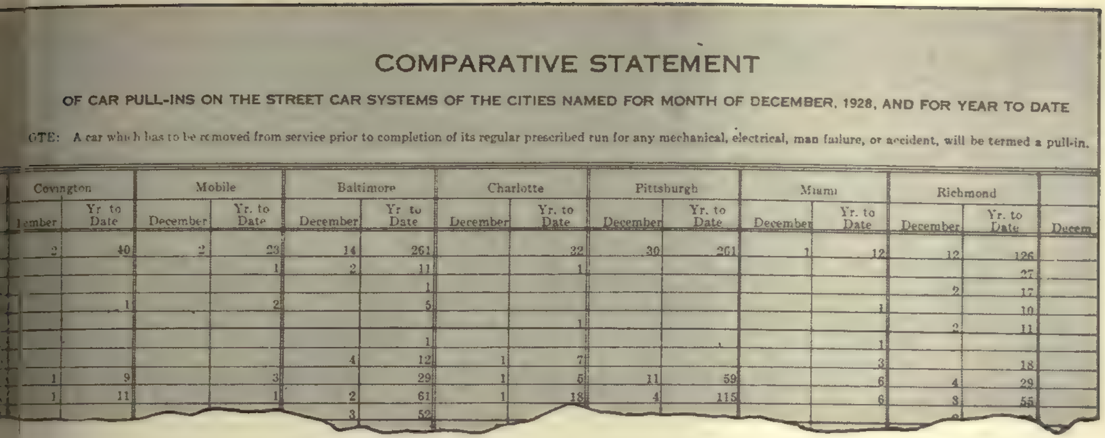


Fig. 3—Car-miles operated per equipment failure were increased from approximately 3,500 in 1921, before the present free interchange of maintenance practices and records, to 30,500 at the present time. The average number of cars operated on these four properties from 1922 to 1927, inclusive, was 1,263. In 1927, equipment failures for the year averaged 1¼ per car operated



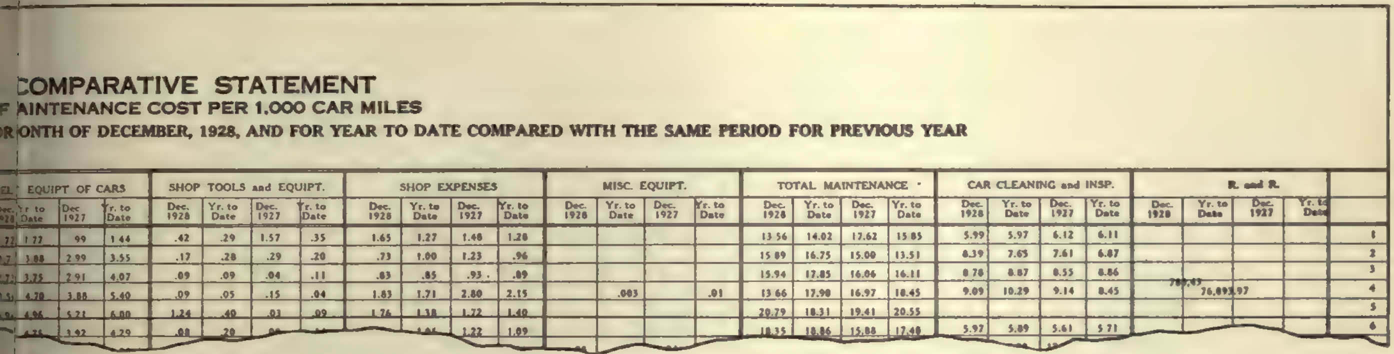
COMPARATIVE STATEMENT

OF CAR PULL-INS ON THE STREET CAR SYSTEMS OF THE CITIES NAMED FOR MONTH OF DECEMBER, 1928, AND FOR YEAR TO DATE

OTE: A car which has to be removed from service prior to completion of its regular prescribed run for any mechanical, electrical, man failure, or accident, will be termed a pull-in.

Covington		Mobile		Baltimore		Charlotte		Pittsburgh		Miami		Richmond		
ember	Yr. to Date	December	Yr. to Date	December	Yr. to Date	December	Yr. to Date	December	Yr. to Date	December	Yr. to Date	December	Yr. to Date	Decem
2	40	2	23	14	261		32	30	261	1	12	12	126	
			1	2	11		1						27	
					1							2	17	
	1		2		5						1		10	
							1					2	11	
					1						1			
				4	12	1	7				3		18	
1	9		3		29	1	5	11	59		6	4	29	
1	11		1	2	61	1	18	4	115		6	8	55	
				3	52									

Comparative statements of maintenance costs and detailed pull-in records are compiled monthly by the secretary of the E.R.A.E.M., Sou. Prop., and sent to each member company



COMPARATIVE STATEMENT
AINTENANCE COST PER 1,000 CAR MILES
ONTH OF DECEMBER, 1928, AND FOR YEAR TO DATE COMPARED WITH THE SAME PERIOD FOR PREVIOUS YEAR

EQUIPT OF CARS			SHOP TOOLS and EQUIPT.				SHOP EXPENSES				MISC. EQUIPT.				TOTAL MAINTENANCE				CAR CLEANING and INSP.				R. and R.				
Yr. to Date	Dec. 1927	Yr. to Date	Dec. 1928	Yr. to Date	Dec. 1927	Yr. to Date	Dec. 1928	Yr. to Date	Dec. 1927	Yr. to Date	Dec. 1928	Yr. to Date	Dec. 1927	Yr. to Date	Dec. 1928	Yr. to Date	Dec. 1927	Yr. to Date	Dec. 1928	Yr. to Date	Dec. 1927	Yr. to Date	Dec. 1928	Yr. to Date	Dec. 1927	Yr. to Date	
1.77	.99	1.44	.42	.29	1.57	.35	1.65	1.27	1.48	1.28					13.56	14.02	17.62	15.85	5.99	5.97	6.12	6.11					1
3.88	2.99	3.55	.17	.28	.29	.20	.73	1.00	1.23	.96					15.89	16.75	15.00	13.51	8.39	7.65	7.61	6.87					2
3.75	2.91	4.07	.09	.09	.04	.11	.83	.85	.93	.89					15.94	17.85	16.06	16.11	8.78	8.87	8.55	8.86					3
4.70	3.88	5.40	.09	.05	.15	.04	1.83	1.71	2.80	2.15		.003		.01	13.66	17.90	16.97	18.45	9.09	10.29	9.14	8.45	789.43	76,893.97			4
4.96	5.21	6.00	1.24	.40	.03	.09	1.76	1.38	1.72	1.40					20.79	18.31	19.41	20.55									5
[illegible]	3.92	4.29	.08	.20	[illegible]			[illegible]	1.22	1.09					18.35	18.86	15.88	17.40	5.97	5.89	5.61	5.71					6

entirely convincing. Poorly maintained rolling stock could not have made the performance shown in Figs. 2 and 3.

Furthermore, the reduction in maintenance cost has been achieved in spite of the fact that wages have increased 38 per cent since 1919 and material prices have gone up slightly. It is interesting to note that the present high standard of maintenance is accomplished with fewer employees than were required ten years ago. From 1919 to 1921, inclusive, the average number of shop and carhouse employees was 943. The average for the next six years was 829, an average reduction of 12 per cent. The number of employees in these departments has been steadily reduced until in 1927 only 737 men were required. From incomplete figures available for 1928 still further substantial reductions are indicated.

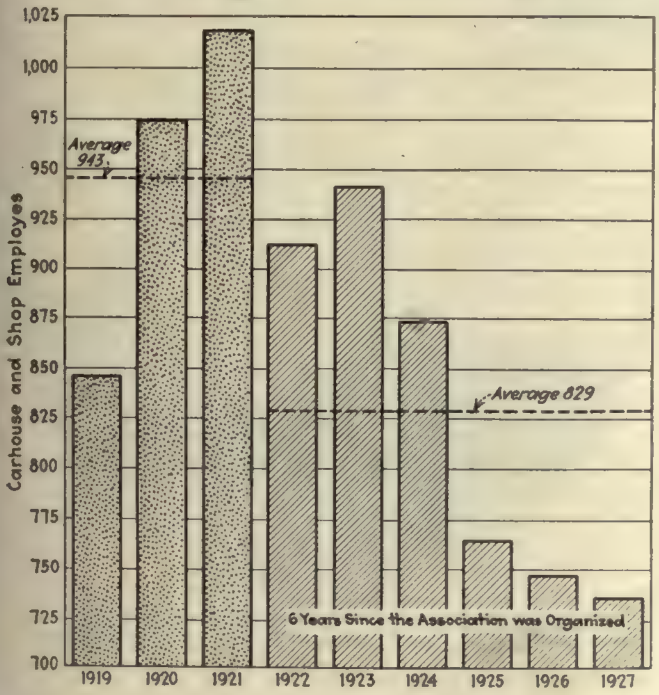


Fig. 4—Although wages for maintenance employees have increased approximately 38 per cent since 1919 on the four Southern properties included in this study, there has been a considerable reduction in the number of men on carhouse and shop work. Better organization, closer supervision and more thorough inspection have made possible this steady decrease in man power

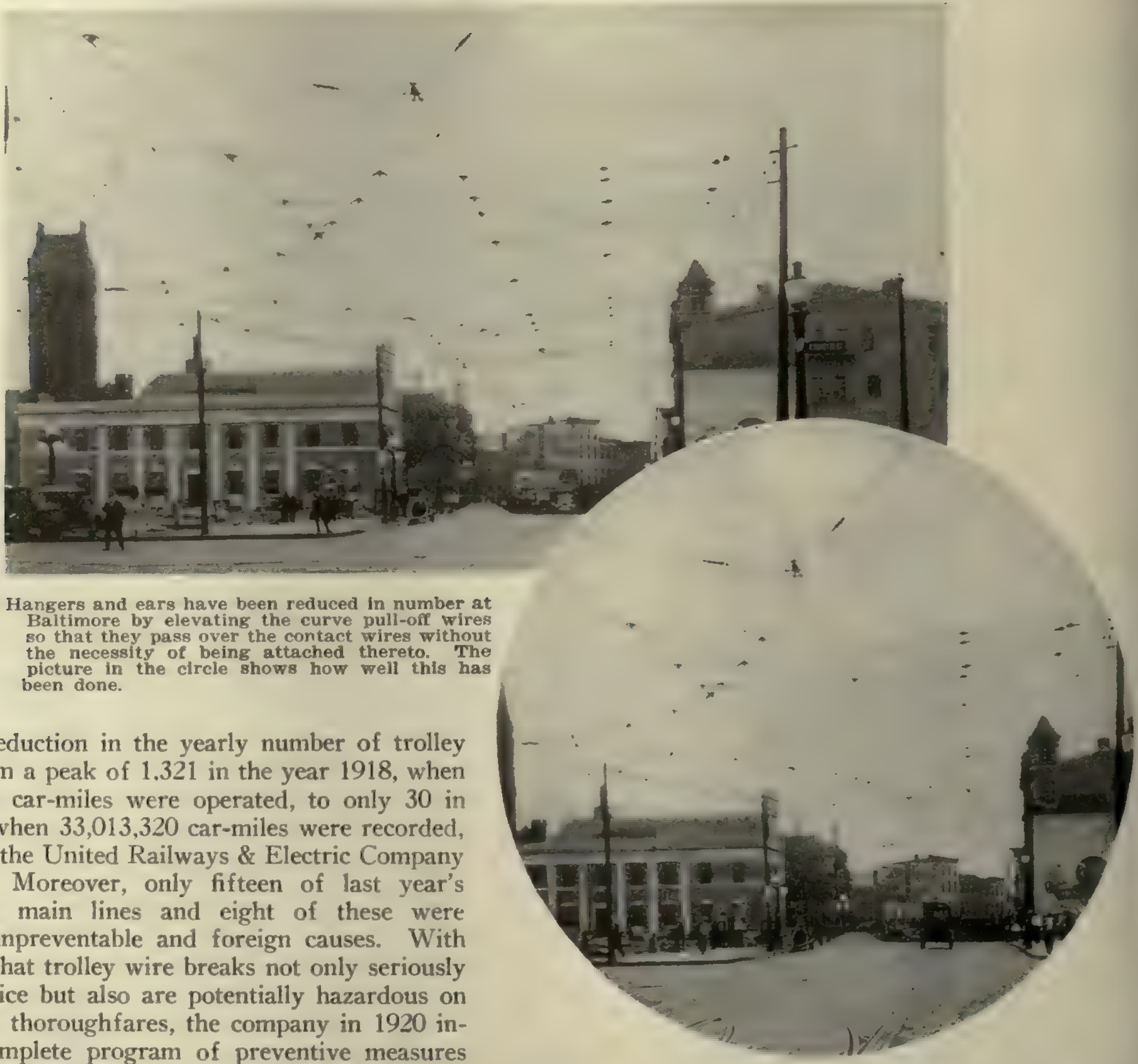
Just what has happened on these properties to account for these very favorable mechanical department records? The writer firmly believes that the most influential factor is the free and frank interchange of operating data and maintenance experience and the discussion of common problems among the mechanical men comprising this group of properties. Their association is the vehicle through which they interchange their information and ideas. The publication of the cost data and the service records of equipment undoubtedly has stimulated the interest of every man in the mechanical departments. There has been created through this medium a desire on each property to improve past performance and to raise the standard of each company in the group.

Naturally, this spirit had to be fostered by those in charge of the work. Back of the performance on each of these properties lies a story of careful organization, painstaking study and critical analysis of methods, with unceasing effort to improve conditions. Inspection has been put on a very thorough and systematic basis which makes it possible to locate and remedy incipient defects before they become sufficiently serious to cause car failures. Overhauling of equipment is done periodically and most thoroughly. The intervals between overhauls are such that the cars may reasonably be expected to operate without serious trouble.

Editor's Note—This study of the records of these four Southern properties will be followed in a later issue by a discussion of the methods through which maintenance costs and equipment failures were reduced.

Trolley Wire Breaks PREVENTED by Alert Maintenance

By
W. T. TRAUTMAN
**Superintendent of Emergency Division
United Railways & Electric Company
of Baltimore**



Hangers and ears have been reduced in number at Baltimore by elevating the curve pull-off wires so that they pass over the contact wires without the necessity of being attached thereto. The picture in the circle shows how well this has been done.

STEADY reduction in the yearly number of trolley breaks from a peak of 1,321 in the year 1918, when 32,569,906 car-miles were operated, to only 30 in the year 1928, when 33,013,320 car-miles were recorded, is the record of the United Railways & Electric Company of Baltimore. Moreover, only fifteen of last year's breaks affected main lines and eight of these were chargeable to unpreventable and foreign causes. With the knowledge that trolley wire breaks not only seriously impair the service but also are potentially hazardous on heavily-traveled thoroughfares, the company in 1920 inaugurated a complete program of preventive measures including the rehabilitation of the overhead trolley wire system together with a plan for inspection and maintenance to insure the detection and elimination of incipient faults before failures developed. The success that has attended these efforts is attested by the physical results achieved as well as by the consequent decrease in maintenance costs to the extent of $30,000 annually.

Whereas under former practice all trouble crews were held in idleness at their respective stations, awaiting emergency calls, the plan now in effect employs the majority of these forces actively and usefully in inspection and maintenance work. The results thereby obtained reaffirm the truth of the old adage about "an ounce of prevention being worth a pound of cure." As now organized, the emergency division of the power department functions not only in all emergency cases of whatever nature, but it is also

During past decade the United Railways & Electric Company of Baltimore has effected a steady reduction from 1321 to 30 breaks per year. Annual maintenance costs have been cut by $30,000. Taut contact wire, slack spans, shorter ears and U-groove wheels have been instrumental in this improvement

responsible for the general condition of the entire overhead trolley structure. Five crews comprise the day shift and four are used on the night shift, each crew consisting of a lineman, a helper and a chauffeur, together with a tower truck especially designed and equipped for the purpose. Line cars also are available at convenient locations and are used instead of the motor trucks when more suitable for work on suburban sections having open track construction.

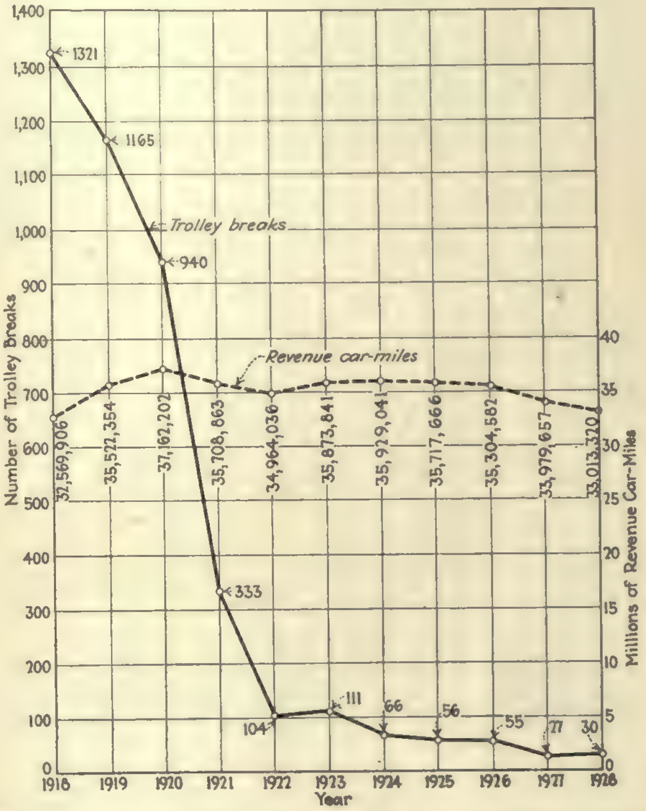
One crew is normally held at division headquarters at all times in readiness to respond to emergency calls such as fires, accidents, blockades, etc., and for the duration of the morning and afternoon peak hours all crews stand by at their respective stations so as to be immediately available if needed. During the remainder of the time, however, all except the single crew held for emergency service inspect and maintain the overhead structures. They keep in frequent communication with the emergency dispatcher so they can be readily located whenever required to augment the reserve crew. Each crew is assigned a certain portion of the system, approximately 60 miles of single track, and is held accountable for the upkeep and general condition of the overhead structures. In this way the entire system is covered thoroughly not less than once a month with the result that practically all defective conditions are discovered and remedied before they have a chance to develop into hazards or service detentions.

Alert and skilled inspection and maintenance have been largely responsible for the record of diminishing trolley breaks, but certain other important factors have also contributed in no small measure to the results that have been realized.

Of primary importance is the matter of trolley wire. Bronze wire of the highest grade obtainable is now purchased under rigid specifications, as compared with the former method of buying on price, and a company engineer inspects and tests the wire at the point of manufacture, all reels not meeting the specification requirements being rejected. The amount of wire required each year for section renewals is purchased in one lot on competitive bids, and is usually erected in the spring of the year when temperatures are mild and uniform. The wire is stretched taut when erected, a dynamometer being used to determine when the definite tension required with the prevailing ambient temperature conditions has been obtained, in accordance with the tension-temperature curves shown in an accompanying chart for Nos. 00 and 000 bronze wire having an ultimate tensile strength of approximately 65,000 lb. per square inch.

In order to mitigate as much as possible the injurious effects of suspension "hard spots," the supporting span wires are kept as slack as practical, consistent with the height of the poles and the standard clearance that has to be maintained above the rails. Wear is watched carefully, especially at vulnerable locations, and any wire reported by the crews as being worn beyond the allowable limit is personally inspected by the superintendent of the division before renewal is made.

One of the most pertinent factors related to any study of how to keep overhead trolley structures in condition is, obviously, the design of the trolley wheel collector. After all, it is the functioning of this device that is responsible for the ultimate destruction of the contact conductor and its accessories. Several years ago in Baltimore it was recognized that a trolley wheel having a wider and differently shaped groove than the one then in use would be considerably less injurious to the trolley wire and fixtures, especially by minimizing arcing and reducing excessive impact on the wire at the leaving ends of ears and other attachment fittings. Accordingly, the V-groove wheel then in use was superseded by a modified U-groove type of wheel with excellent results in reducing unnecessary wear of the wire and also in greatly prolonging the life of the supporting ears, as shown by the fact that the number of ears renewed each year has since decreased from approximately 48,000 in 1925 to about 12,000 at present. Worn-out, defective and improperly lubricated wheels, if permitted to remain in service for any length of time, are exceptionally severe on the overhead contact structures and may cause many dollars' worth of damage. Consequently, whenever an arcing or noisy wheel is noticed it is immediately reported to the proper carhouse for attention.

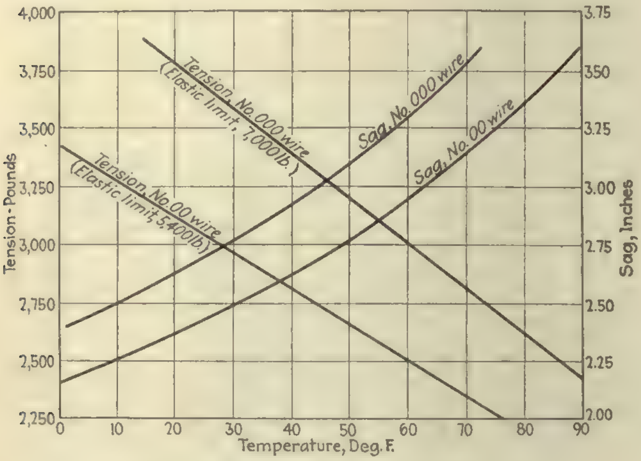


The number of trolley wire breaks has been greatly reduced while the number of car-miles operated has remained practically constant

Still another factor which influences to an appreciable extent the work of maintaining the overhead structure efficiently and economically is the type and character of the trolley supporting ear used at suspension points. Extensive study has been given to this troublesome problem and various service tests are in progress to determine the device best suited generally for the purpose. One of the essential features, of course, is that the ears should have proper taper-ground ends to provide a smooth approach and runoff for the trolley wheels, and all ears now purchased for use on this property satisfy this requirement. As a result of using high-grade ears of an approved design and, as previously mentioned, slack span wires, taut trolley wire and U-groove trolley wheels, the well-known and highly destructive gouging or cupping form of wear on trolley wire encountered at the ends of ears has now been virtually eliminated.

During the past several years, 9-in. ears have been used in the erection of new trolley wire, the original intention having been to replace these when worn out with ears of 12-in. length, should the wire show evidence of cupping, and later on with 15-in. ears if necessary to cover up and protect new depressions. So far, however, by reason of the almost complete disappearance of this form of wear, it has not been found necessary to resort to the longer ears, and the 9-in. ear is, consequently, now being used almost exclusively on the entire system.

At special work locations, where the most severe and troublesome conditions are encountered, wire life has been prolonged, the use of expensive fittings reduced, and better alignment is being maintained through the elimination of all fittings not actually required to support the trolley wires or hold them in place. Accompanying illustrations show how a number of hangers and ears have been removed advantageously from special work by elevating the curve pull-off wires to a point on the poles, so that they will pass over the straight line portions of the contact conductors without the necessity of being attached thereto in accordance with the customary practice.



Tension and sag of bronze trolley wire

Temperature range—0 to 90 deg. F., pole spacing—110 ft. Wind and sleet loads were neglected in calculating stress and sag. Modulus of elasticity = 18.14 × 10^6. Coefficient of linear expansion = 9.39 × 10^{-6}.

Additional savings are also being realized as a result of protecting all splicing ears and the approaches to frogs with bronze trolley armor, which is ground to a taper finish on each end to provide a smooth approach and runoff for the trolley wheels. Trolley armor is appreciably cheaper than splicing ears and prolongs the life of the fittings indefinitely.

Further economies and fewer service interruptions have also resulted through reducing the number of accidental car pull-downs by equipping all frogs and small-degree crossings with pans specially designed to prevent trolley harps from becoming caught in the crotches of these fixtures in cases of dewirements.

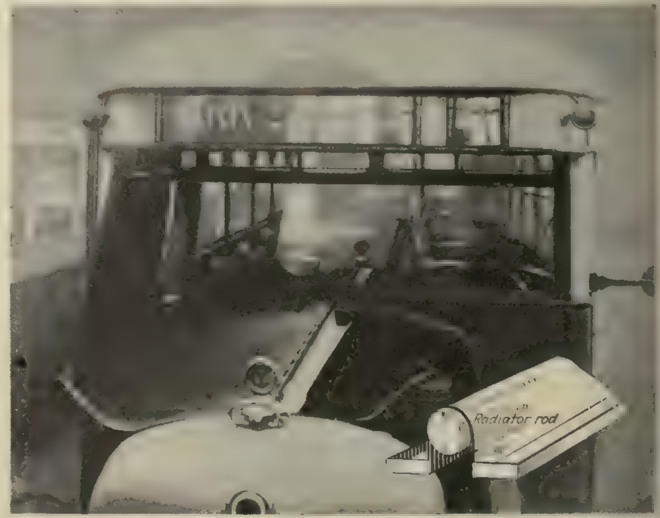
Although the number of trolley breaks due to causes within the direct control of the company decreased rapidly under the co-ordinated program of inspection and maintenance, it was noted several years ago that a comparatively large number of breaks continued to occur as a result of burn-downs by cranes, steam shovels and similar equipment operated by other utilities and contractors. The problem of reducing the number of burn-downs chargeable to these foreign causes was approached by addressing letters to all the contractors in the city operating such equipment, outlining the hazards and inconvenience incident to a broken trolley wire and requesting their co-operation in preventing such occurrences by notifying the trouble dispatcher of the intention to move the equipment so that a trouble crew might be sent without charge as a convoy to assist in moving the apparatus across the company's tracks. The response to this request has been almost unanimous, and burn-downs due to contractors' equipment are now very infrequent.

As a direct result of these various measures and methods the company has succeeded, in a comparatively short time, in establishing a record in the reduction of trolley breaks and service detentions far beyond original expectations; and, as a byproduct, has been further rewarded with a material reduction in maintenance expense. The success of the undertaking, however, must be credited in great measure to the untiring efforts and initiative of the men of the emergency division, who have shown an eagerness and persistency that could scarcely have resulted otherwise.

◆

Auxiliary Rain Troughs for Bus Engines

As a double precaution against motor failure during severe rain storms from the leakage of water through the engine hoods onto the ignition wiring, the International Bus Company, subsidiary of the International Railway, Buffalo, N. Y., and the Philadelphia Rapid Transit bus organization, has equipped its whole fleet—90 buses in Buffalo, 610 in Philadelphia—with an auxiliary rain trough of its own design.



The rain trough is made of ordinary light-weight sheet metal, so shaped as to fit snugly over the radiator tie rod and slope sufficiently toward the rear to lead all water away from the ignition circuits

The rain trough is located directly beneath the center hinge of the engine hood and rests on the radiator tie-rod. Constructed of sheet metal, it is so designed as to drain the water to the rear of the engine and away from all electrical circuits. Simple as this addition to the bus engine seems, it has served to eliminate all complaints arising from the short-circuiting of the ignition system of the bus engine during bad storms.

Night shovel gang at work on Euclid Avenue track reconstruction job

Careful Organization Essential for Rapid Track Reconstruction

By
HOWARD H. GEORGE
Superintendent of Way
Cleveland Railway

Greatest possible speed is desirable from standpoint of public relations. To accomplish this the working force must be thoroughly trained in their jobs, and every detail planned in advance. Recent track renewal in Cleveland furnishes an example of how this was done successfully

GENERALLY speaking, speed is desirable in any construction operation, and within certain limits results in the greatest economy. Speed in construction, however, involves two important factors: i.e., proper equipment and proper organization. The maintenance of a street railway naturally involves a certain amount of work during the entire year, but, unfortunately, it is impossible to spread the work uniformly over the entire period, particularly in our Northern climate. The organization must be skeletonized during the winter months, but at the same time lend itself readily to rapid expansion when the construction season opens. This makes the problem of organization a difficult one, especially when it is necessary that the piece of work be done speedily.

It is a generally recognized principle in all large construction work that the best equipment available is none too good for the job. This applies particularly to the work of constructing tracks. Contractors and engineers are constantly seeking for improved and more efficient machinery, but the fact must not be lost to sight that the equipment may be 100 per cent satisfactory and at the same time the entire operation fall flat because the organization of the personnel was inadequate. The two factors go hand in hand and cannot be considered alone.

No construction job of any size should be undertaken without a reasonable construction schedule being planned in advance. This constitutes a bogey and gives every part of the organization concerned something at which to aim, and a mark to beat if possible. It is equally important that every subdivision of an organization be thoroughly familiar with the part it is to play on every job. This means definite instruction in advance. The smooth working of such an organization is materially

New track ready for surfacing gang

assisted by regular conferences between the department head and the various responsible sub-department heads.

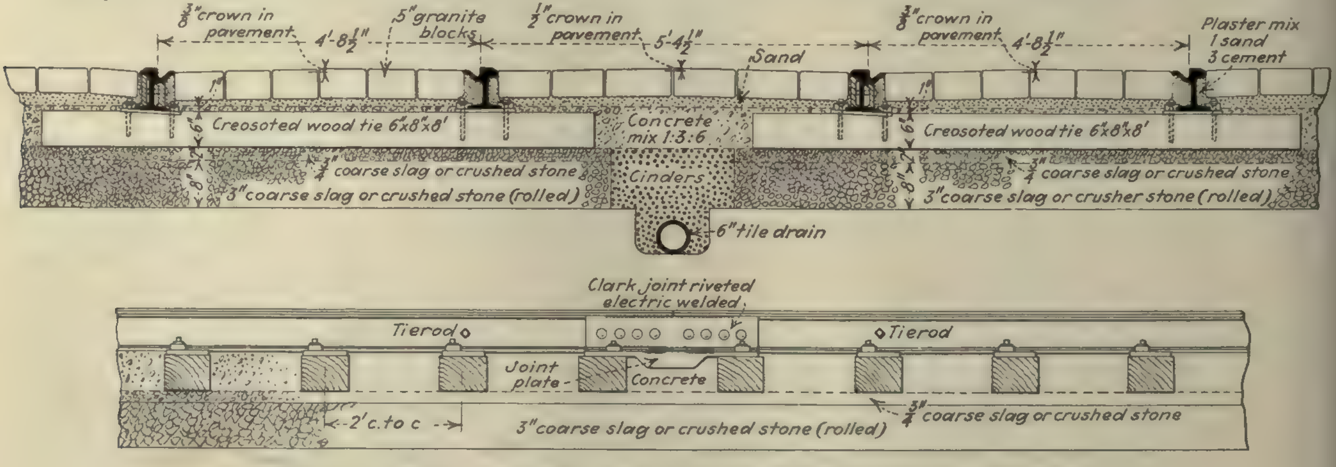
It is frequently the case that as long as an organization is called on to perform only the ordinary routine work everything goes quite smoothly, but that it fails to stand up under the strain of emergency demands. This should not be true, and in order to be prepared for the unusual demands a construction organization should be so planned as to be readily susceptible to expansion. In addition, a certain amount of extra equipment should be kept in reserve or else a definite source of supply should be assured from outside. This means that every man in the organization who acts in a supervisory or executive capacity must have at least one man whom he has trained for the job higher up, so that, when the time for expansion comes, there are already in the organization men ready to take on the work of running the necessary additional construction crews and other incidental work.

There seems to be, in many cases, a disinclination among heads of departments to train assistants to handle every phase of their jobs, or to delegate any authority to them or divide responsibility with them. This may, in some cases, be because the individual concerned has under him subordinates who are not fully qualified to take over his work but where, for reasons beyond his control, he is obliged to retain the services of such individuals. Generally, however, where a department head insists upon shouldering the entire responsibility himself, it is due to an exaggerated sense of egotism and not to any inability on the part of his subordinates to measure up to any responsibility which may be put up to him. As a matter of fact, the successful direction of any departmental organization or business enterprise depends largely upon the ability of the head to devote all of his time and attention to studying the functioning of his organization in perspective, in comparing the work it is doing with that which is being done by others, and in working out plans for simplifying and improving his own practices.

Because the organization of the Cleveland Railway Company's way department was prepared for emergencies, it was possible to meet the unusual demand imposed upon it in the reconstruction during the past year of the double track on Euclid Avenue from East 55th Street to East 105th Street, necessitating the reconstruction of 3.41 miles of single track. The street is one of the main east and west thoroughfares of Cleveland. In addition, it is one of the principal business streets, being devoted for a considerable part to the automobile sales houses. As it had been necessary to tear it up and interfere with business and traffic for extensive trackwork less than four years before, it was the decision of the management that the work should be expedited in every way possible and that the total time for the completion of the necessary replacement should be reduced to the absolute minimum.

The general design selected for the new track in Euclid Avenue is shown in the accompanying cross-section. Although T-rail was used on this job, the cross-section was subsequently modified for other jobs using the A.E.R.E.A. standard grooved-girder rail and screw spikes and clips. The old steel ties and concrete base were completely removed and a creosoted wood-tie construction laid on crushed slag ballast was substituted.

The work was started on May 11 and, with the excep-


3/8" crown in pavement
4'-8 1/2"
5" granite blocks
1/2" crown in pavement
5'-4 1/2"
Sand
3/8" crown in pavement
4'-8 1/2"
Plaster mix 1 sand 3 cement
1"
6"
8"
Creosoted wood tie 6"x8"x8'
Concrete mix 1:3:6
Creosoted wood tie 6"x8"x8'
3/4" coarse slag or crushed stone
Cinders
3/4" coarse slag or crushed stone
3" coarse slag or crushed stone (rolled)
3" coarse slag or crusher stone (rolled)
6" tile drain
Clark joint riveted electric welded
Tierod
Tierod
Joint plate
Concrete
2' c. to c
3" coarse slag or crushed stone (rolled)
3/4" coarse slag or crushed stone

Standard track section with 102-lb. girder rail. Tee rail was used on Euclid Avenue tion of a short stretch at East 79th Street which was left pending a decision by the city relative to street widening details at this point, it was practically completed by the middle of July. The exception noted could easily have been completed by the same date had there been no question at issue regarding the track location at the time the adjoining track was under reconstruction.

In order to make this speed possible, the work was carried on practically without interruption day and night. The first operation was the placing of the temporary track and crossovers which were used during the day for regular car operation in connection with the track not under reconstruction. During the night the second main track was turned over for work trains, and passenger car operation made a two-way affair over the temporary side track by means of block signals. This temporary side track is permanently assembled in sections brought to the job on flat cars and laid on boards set closely together on top of the street pavement as near to the curb as practical, the track being shimmed to a sufficiently accurate grade to permit safe operation. Runoffs were set at various points on this track to take care of expansion and contraction. About 7,500 ft. of temporary track was necessary, this being shifted from section to section as required. The actual work of bringing this material to the job and shifting from one section to the other and as much of the connection work as possible was done at night, the day crew completing it the next morning.

During construction, temporary crossings were provided over the side track and open trench, old ties, broken concrete, and slag screenings being used for this purpose. Loading platforms of fine slag screenings were provided at all car stops for the benefit of passengers boarding cars on the temporary track, or alighting therefrom.

As soon as operation had been diverted to the temporary track, the old Amiesite pavement surface was removed, air compressors and air-operated cutting tools being used. It was then shoveled by hand to one side and later thrown back in the trench to be loaded by the power shovels along with the rest of the excavated material.

The next operation was the breaking up of the concrete. Two Clark concrete breakers were used for this purpose, one breaking up the top layer of concrete forming the pavement base. A gang of laborers shoveled this out of the trench and the second breaker then passed over the track and broke the foundation concrete.

The rail was then burned at the joints with acetylene torches. The nuts holding the rail to the ties were also burned and knocked off by a track gang, which also overturned the loosened rail. At night, the derrick picked up the old rail and loaded it on flat cars for removal to the material yard.

Tearing up old track without interference to car service which continued uninterrupted in both directions

Shovels started working at 8:30 p.m., which was the earliest the second main track could be released. Work stopped at 4:45 a.m., so as to permit resumption of double-track operation. The only exception to this was in the case of the westbound track between East 77th Street and East 79th Street, where work of the shovels did not start until midnight and stopped at 4:45 a.m.

Most of the new track material was handled at night in order to reduce to a minimum the delays to operation of passenger cars through the day. The coarse slag for ballast was dumped directly into the track trench, the fine slag being deposited in the space between the trench and the temporary side track. Concrete aggregate was landed in the same way as the fine slag. Ties were unloaded and placed in the trench at night as far as the foundation had been rolled. Otherwise, they were piled along the sidewalk at convenient locations to be placed in the trench by the day crew. All rail was unloaded by derrick at night and laid on the ties in the track trench as far as the ties could be placed, the balance of the rail being distributed on the street pavement just outside the trench.

One track was completed and placed in operation, before work was begun on the other track

The foundation consists of 8 in. of coarse slag, thoroughly rolled with a 10-ton tandem type roller, this base being covered with fine slag which was washed down and rolled into the coarse slag base. On this base the track was then laid and spiked to the ties. Fine slag for tamping was thrown in the trench, 2 in. being allowed for tamping under the ties on the rolled base. The tamping was in this instance mostly done with electric tie-tamping machines. As soon as the track had been tamped to surface and lined, all surplus tamping material was removed from between the ties.

Riveting and welding crews then completed the assembly of the rail joints, followed immediately by the concreting machine. Care was taken in the joint assembly to obtain as complete a closure between rail ends as possible. The rail and splice-bar drillings were arranged so as to provide $\frac{1}{16}$-in. draw at the two center holes, a drift pin being used to pull the rail ends tightly together. Heat-treated rivets were used to secure the plates, and the seams then welded. A baseplate was used under each joint, the rail base being welded to this plate.

Concreting Was Done Carefully and Lumnite Cement Used as Needed

In concreting the track, care was taken to see that the concrete was of uniform quality and that it was carefully tamped around the ends of the ties and under the rail base between ties and under the joint baseplates. As soon as the concrete had set, the fine slag screenings were distributed over the concrete for a paving cushion. The paving-gang laborers arrived on the job at 3 a.m. to unload the granite paving block and fine slag cushion. The pavers started at 7 a.m., the entire space between rails, including the devilstrip, being paved with new granite block. The space outside the outer rails was paved with asphalt for an average width of 2.3 ft., this work being done by the Cleveland Trinidad Paving Company under contract. The grouting of the pavement consisted of two parts sand and one part Portland cement. Paving pitch was used at street intersections which had to be turned over to traffic at once. In certain short stretches where it was desired to turn traffic over the tracks in a much shorter time than would otherwise have been practical, Lumnite cement was used for the grout. After the pavers had completed their work, the track grinders went over every rail joint to remove any imperfections in the rail surface.

Clean-up Work at Night

Most of the work of cleaning up was done at night. During the day labor gangs would collect the débris in piles and it would then be loaded on the work trains by the night gangs.

During the period covered by this job it rained on sixteen days and 24 nights. It was necessary partly to suspend operations for this reason on fourteen different days. This fact makes the time record that much more interesting.

The following figures indicate the amount of work involved in this job.

Dirt and concrete excavation	10,434 cu.yd.
Slag used for track base	13,392,000 lb.
Fine slag used for tamping	1,730,000 lb.
Fine slag for paving cushion	3,420,000 lb.
Granite paving block	411,829 block
Sand for grouting pavement	358,000 lb.
Cement for concrete base and grouting	18,783 sacks
Gravel for concrete	5,190 tons
Oak ties	8,702
102-lb. rail	34,397 lin ft.
Splice bars	583 pair
Joint baseplates	553
Standard tie plates	16,308
Track spikes	111 kegs
Rivets for joints	4,400

The job required a total of 102,030 man-hours and 8,116 equipment-hours for its completion. The various day and night gangs were organized as follows:

Average day track gang—for 56 days
1 Foreman
5 Sub-foremen
77 Laborers
7 Watchmen
7 Temporary track maint'nce men
2 Temporary crossing men
1 Water boy
—
100 Total

Average night track gang—for 54 nights
1 Foreman
3 Sub-foremen
50 Laborers
2 Watchmen
7 Temporary track maint'nce men.
—
63 Total

Average day paving gang—for 31 days
2 Foremen
22 Pavers
25 Laborers
1 Watchman
2 Truck drivers
—
52 Total

The equipment used in the operation was as follows:

2 Portable burners
4 Schramm air compressors
1 Ingersoll-Rand air compressor
2 Clark concrete breakers
2 Electric shovels
1 Gasoline shovel
2 Steam rollers
1 Gasoline roller
1 Concrete mixer and conveyor
1 Riveter
3 Welding machines
2 Grinding machines
11 Work trains
3 Derrick cars
40 Work cars

This equipment was operated for the following periods:

	Days	Nights
Portable burners	32	[illegible]
Air compressors	38	23
Clark concrete breakers	32	8
*Electric shovels	..	38
*Gas shovel (started May 26)	..	23
Steam rollers	16	..
Gasoline roller (started June 2)	28	2
Concrete mixer and conveyor	33	3
†Riveter	23	1
‡Welding machines	25	1
Grinders	13	..

* Shovels required three men each.
† Riveted 550 joints.
‡ Welded 553 joints.

The cost of the material entering into the work was approximately $150,000 and that of the labor approximately $85,000, a total of approximately $235,000, or about $13 per lineal foot, this including every item of expense in connection with the operation.

REDUCING NOISE of Car Operation

By

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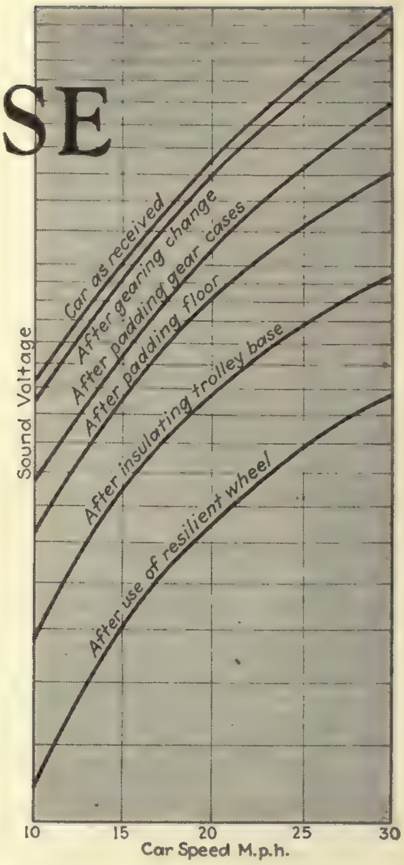
A noisy car has actually been made quiet. Tests show efficiency of various schemes for wheel silencing and results from consistent use of high standards of maintenance. Wheel noise can be reduced considerably by use of grooves filled with lead



Results in eliminating noise plotted to logarithmic scale

TO DETERMINE the efficiency of various methods of wheel silencing numerous tests have been made with the noise-measuring apparatus of the committee on noise reduction of the American Electric Railway Engineering Association. The set-up for the wheel test is shown in an accompanying sketch (Fig. 1). The essential feature of this test consists of striking a uniform blow on the tread of the wheel while it is mounted in the customary manner upon its axle. The wheel under test is blocked up to free it from contact with the rail.

Tests were made of four different wheel conditions as follows: (1) Conventional forged steel wheel without any quieting device, (2) same wheel with four 3-in. wooden blocks bolted to the web near the rim, (3) same wheel with lead ring insert as shown in accompanying sketch (Fig. 2), and (4) resilient wheel as shown in another sketch (Fig. 3).

A sufficient number of tests were made in each case to obtain reliable results. Four typical curves made by the noise evaluating apparatus are reproduced in Fig. 4. From this the silencing value of the various schemes is readily apparent, their ratio being: (1) Conventional forged steel wheel, sound value, 100 per cent; (2) conventional wheel with wood blocks added, 85.9 per cent; (3) conventional wheel with lead insert, 49.7 per cent, and (4) resilient wheel, 16.4 per cent.

Since these tests were made another scheme has been proposed for accomplishing the same purpose. It consists of the use of a ring of iron welded in four spots to the under side of the wheel tread. This plan has been used successfully on gears. Tests are under way to fix a definite value to this scheme. It is believed that its effectiveness will equal that of the lead ring and will have the added advantage of more economical installation.

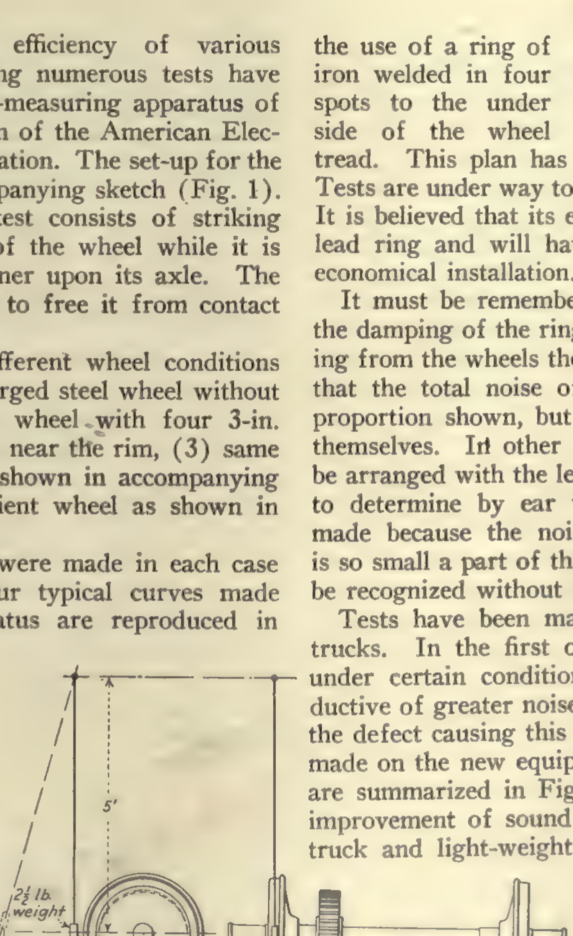


Fig. 1—Set-up for testing various sound muffling methods for car wheels

It must be remembered that the above tests refer to the damping of the ringing or high pitch sounds emanating from the wheels themselves. It must not be inferred that the total noise of the car can be reduced in the proportion shown, but only the sound from the wheels themselves. In other words, all of the car wheels may be arranged with the lead ring and yet it may be difficult to determine by ear that any improvement had been made because the noise due to this particular source is so small a part of the whole that the difference cannot be recognized without instruments.

Tests have been made also on the new worm-drive trucks. In the first of these tests it was shown that under certain conditions the new equipment was productive of greater noise than the standard apparatus; but the defect causing this has now been corrected and tests made on the new equipment. The results of these tests are summarized in Fig. 5, which shows a very definite improvement of sound with the use of the worm-drive truck and light-weight, high-speed motors. With this truck, gear noise is nearly zero and the balance of the improvement is largely due to decreased weight and closer fitting parts.

The question has been raised as to the effect of composition flooring as compared with ordinary wood flooring on noise within the car. To secure information on this point tests were made on a car with wood floor as shown in Fig. 6. After this test was made the car floor was changed to composition floor as shown in Fig. 7, and this test was repeated under the same conditions. The result of the several tests is shown in the graph which is reproduced as Fig. 8, which shows that the composition flooring has a slightly beneficial effect upon noise within the car.

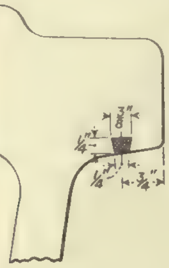


Fig. 2 — Wheel silencing by use of lead ring method

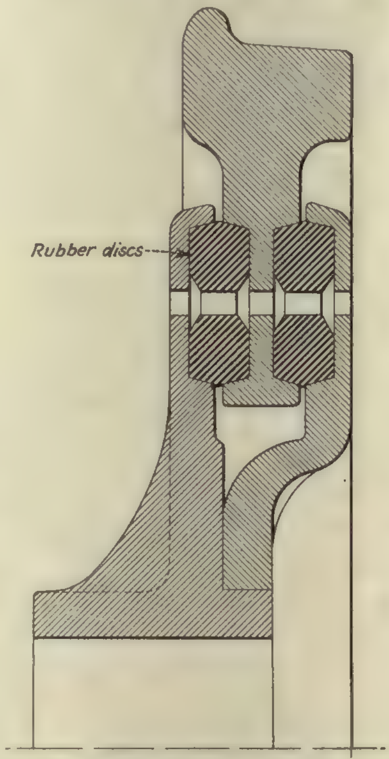


Fig. 3—Type of resilient car wheel on which tests were made

There is need for greater accuracy in the manufacture of gears and pinions in the interest of noise reduction. Changes in construction of gearing, such as muffling, to produce quiet operation are entirely nullified if accuracy is lacking. Gear defects consist chiefly of warpage and eccentricity due to heat-treatment.

In checking over gear discard gages approved by the association in 1926 it appears that too great wear is allowed by the use of these gages. A layout to enlarged scale made of a section of a four-pitch gear and pinion is presented herewith as Fig. 9. This shows new teeth and the same teeth when worn to the limit allowable by the discard gage. The amount of back lash under this condition is $\frac{1}{4}$ in., which is too great. Moreover, by the use of the present recommended design for gear discard gage, gearing which just fails of condemnation by the gage would be kept in service for a considerable period, with the result that by the time the motor is again taken down the wear of the teeth will be much greater than allowable. Noise values mount rapidly when the gear centers are spread. With a spread of gear centers amounting to $\frac{5}{32}$ in., the noise value more than doubles. A spread of this amount means a back lash of approximately $\frac{5}{64}$ in., or about one-fourth of the amount allowable by the discard gage. In view of this, it appears that the gear defect gage should be altered and limits of warpage and eccentricity established to cover the inspection of new gears.

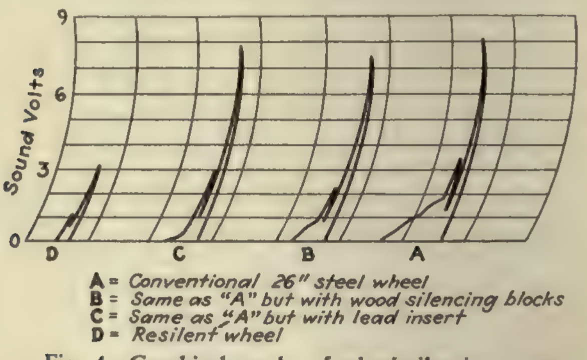


Fig. 4—Graphical results of wheel silencing tests

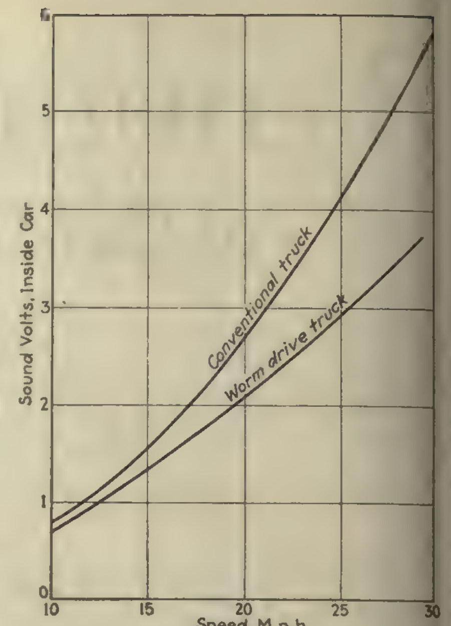


Fig. 5—Comparison of noise of standard and worm-drive trucks

Gear noise is caused by vibration in the material of the gear. The reasons for this may be summarized as follows:

1. Unequal loading of individual teeth, i.e., the load is borne by more teeth at one period than at another, and the increased compressive strains produce vibration.
2. Actual concussion caused by one tooth disengaging before another takes up the load. This allows the following tooth to strike a hammer-like blow with resultant noise and is apt to occur with gearing of low pitch or with spread gear centers. It may also occur during idling.
3. Inaccurate cutting or distortion due to heat treatment may cause the load to be borne by one tooth at a time whereas two or more should always be in engagement
4. Faulty alignment, causing the load to be carried on part of the tooth instead of being distributed over the whole width of the tooth.
5. Bottoming or actual interference of gear teeth.
6. Damaged gearing.

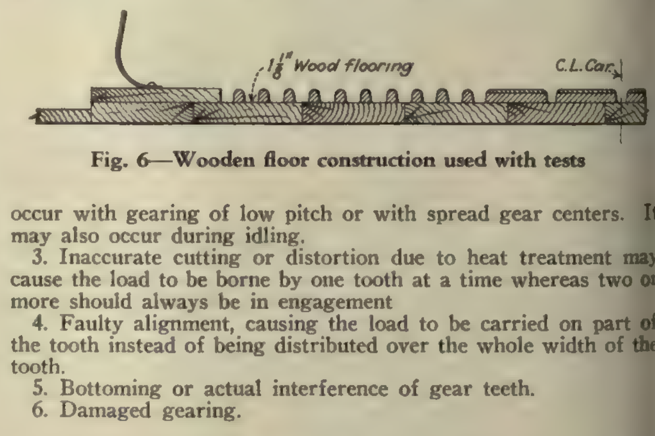


Fig. 6—Wooden floor construction used with tests

As a further step toward the manufacture of quieter spur gearing, it is suggested that attention be given to the use of gears of greater diametral pitch and consequently smaller teeth.

Tests were made on two stretches of track of differing construction but with identical car operation. One type of track was built with steel ties and compressed concrete, as shown in Fig. 10, while the other had granite nose block and compressed concrete pavement with rails

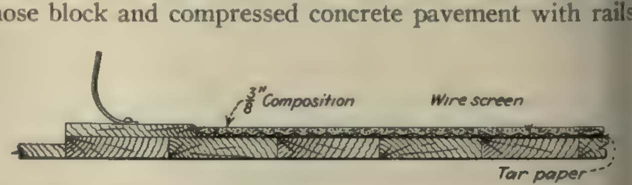


Fig. 7—Type of composition car floor used in tests

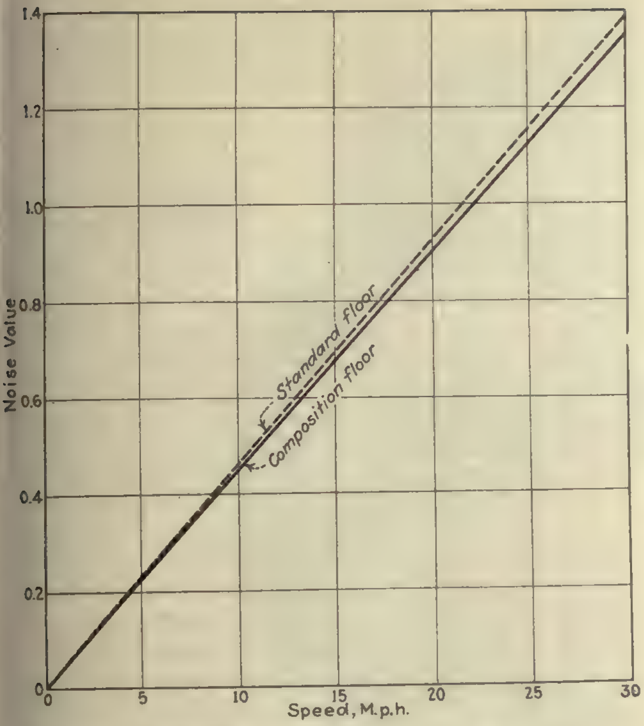


Fig. 8—Comparison of noise with wood and composition floor cars

on wooden ties, as shown in Fig. 11. The sound was measured inside and outside the car, and typical curves showing the results are given in Figs. 12 and 13. These tests indicate that the wooden tie construction is materially quieter than the monolithic concrete type. It is hoped that additional tests on track noise can be made during the coming year, as it is felt that this is important and has been inadequately studied.

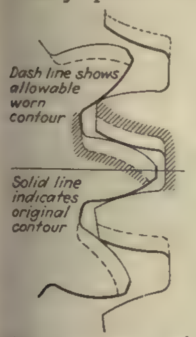

Dash line shows allowable worn contour
Solid line indicates original contour

Fig. 9—Gear and pinion, showing original outline and worn condition allowable with present standard gear discard gage

Much has been done through tests to show what can be accomplished in the way of making present car equipment quiet. A modern type car seating 52 passengers and equipped with four 35-hp. motors was selected, it being at the time a noisy car. Progressive changes were made in the car to make it quiet, and by measurements taken the noise value of each step was determined.

Tests were first made with the car as found, to measure the amount of noise which it was creating. It was apparent to the ear that the gearing was very noisy so the car had its gears and pinions changed and the test repeated. In changing the gearing no special gears were used, merely new stock gearing without special selection. This change showed much improvement.

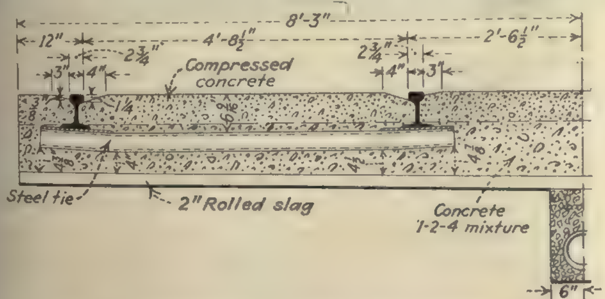


Fig. 10—Track construction with steel ties and concrete

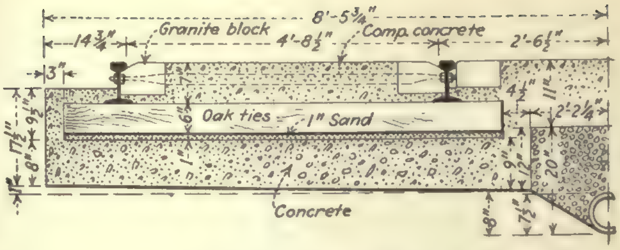


Fig. 11—Granite nose block and compressed concrete pavement with rails on wooden ties

Following this test the gear cases were covered all over with ¾-in. felt and a third set of tests made. This was found to have resulted in still further reducing the noise. Next, the underside of the car floor was covered with ¾-in. soft felt and tests under this condition again showed material betterment.

The next step was to equip the trolley base with a resilient mounting. Rubber was used for this purpose, the type of support being identical with that used by the noise reduction committee in its air compressor tests of 1927. The entire weight of the base was carried on four rubber supports, one of which is shown in detail in Fig. 14. This mounting effectively absorbs the trolley vibration.

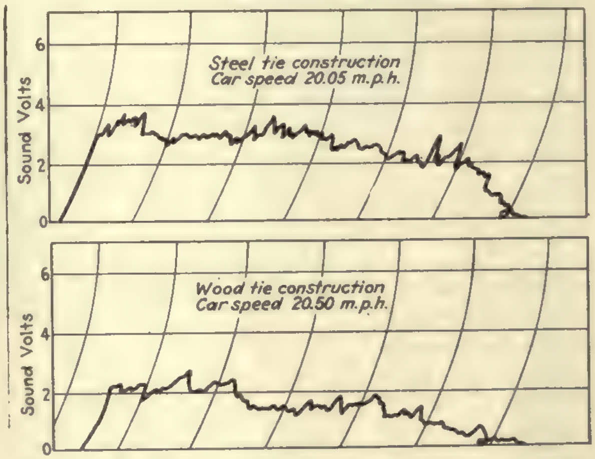


Fig. 12—Comparison of noise measured inside car while operating over track with wood and steel ties.

The final experiment included changing the car wheels

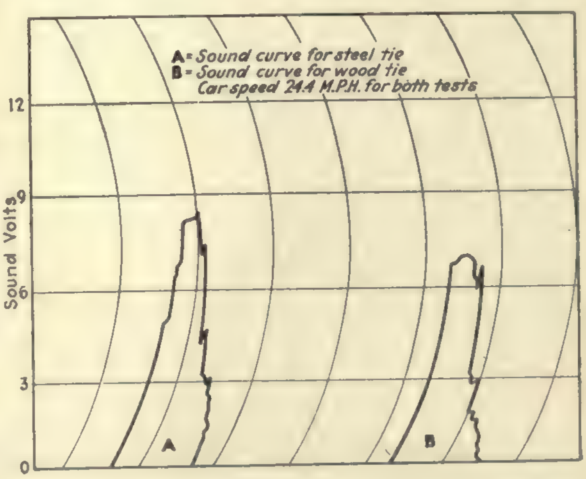


Fig. 13—Comparison of noise measured at the curb line while car was operating over track with steel and wood ties

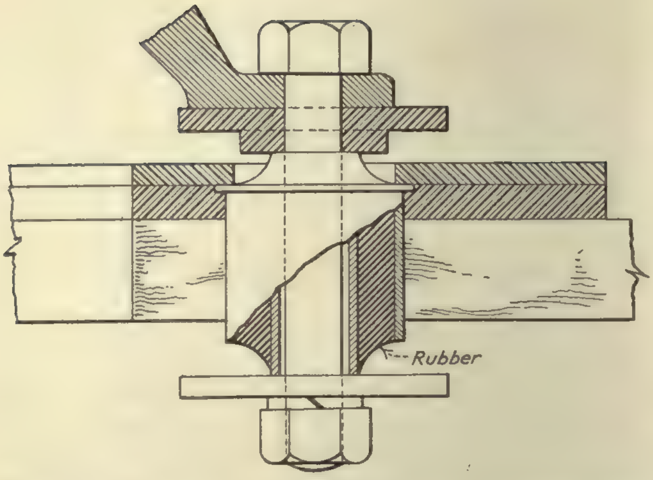


Fig. 14—Method of mounting trolley base to eliminate noise

and equipping with resilient wheels as shown in Fig. 3. One pair of these wheels uses heat-treated aluminum for the central section. Moreover, the construction of this wheel permits not only vertical motion but radial motion as well. Consequently, in starting the sudden jar on the gear is cushioned. In addition, this type of wheel improves the riding qualities of the car very materially.

Results of these progressive tests are shown in Fig. 15, from which it will be seen at a glance that each step has been productive of definite results. It must be remembered that these curves represent definite scientific measurements made with all possible care and the personal element is eliminated. Sound vibration amplitude measurements are made with a recording meter while speed measurements are taken from an indicating tachometer. The same car was used throughout the tests and they were made over the same track with as nearly identical weather conditions as possible.

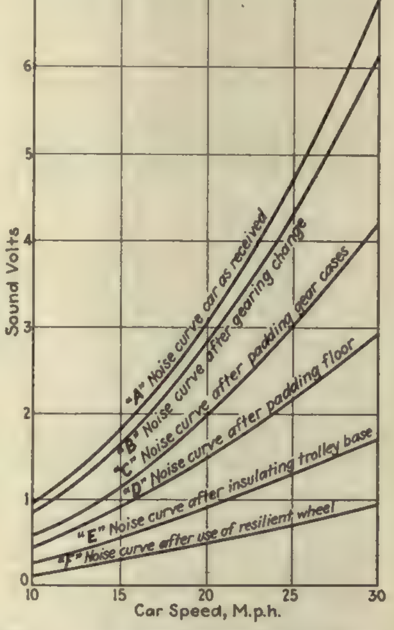


Fig. 15—Progressive results obtained in eliminating noise

In Fig. 15 the results are plotted exactly as taken from the instruments. However, we are chiefly concerned with the effect of this sound upon the ear. The ear does not interpret sound in a direct ratio to the amplitude of the wave which produces it. The ear is affected in a nearly logarithmic ratio. So, in order to get a correct picture of the situation it is necessary to change Fig. 15 to a logarithmic scale, which has been done in the cha appearing at the beginning of this article, which show the true view of the situation.

As a result of this investigation, it has been demor strated that with moderate expense the noise inside th car—that is, the noise which is heard by the passenger can be reduced by 31 per cent. This refers to th progressive changes mentioned up to the last step, whic is the use of the resilient wheel. The last step is much more expensive item, but with it included the tota noise within the car can be reduced 47 per cent. Th noise as measured at the curb is reduced 18 per cent b the whole procedure mentioned in this article.

As so much effort is being expended upon noise reduc tion, special attention is called to one of the basic prin ciples involved in making sound insulation of maximum effect. This principle is to treat sound insulation exactl as if it were electrical insulation. Resilient padding i effective to damp the noise, but so long as there is meta contact between the parts a large amount of vibration will be transmitted. For example, with the resilient wheel the rim is entirely carried on rubber and no rigid metallic contact of any kind is permitted between the rim and the hub. If the bolts which assemble the parts of the wheel permitted metallic contact between the parts the effectiveness of the wheel would be reduced. The same is true of the trolley base mounting.

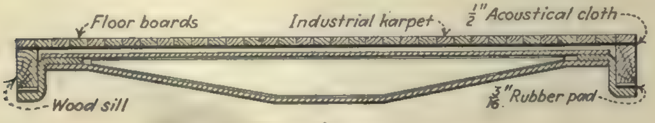


Fig. 16—Car body noise insulation

Newspapers Sold on Cars

MORNING newspapers are now sold on the cars of the New Brunswick Power Company, which operates the street railway in St. John, N. B. Every car on the system has been equipped with a box of the type shown in the illustration, which has a rack for holding the papers and a cash box which forms a receptacle for the coins. Payment is made on the honor system. Results of this service have been very gratifying, both to the publishing company and to the railway. It has been of value to those who do not have delivery of papers at their homes. There has been no conflict with the local distributors or the newsboys, and it is stated that sales from these sources have not fallen off. Many remarks of commendation have been received from passengers. The honor system is respected and the loss from theft of papers is quite small.

Type of tank used in chromium plating, showing apparatus for the control of current strength

Life of Mechanical Parts

Prolonged by Chromium Plating

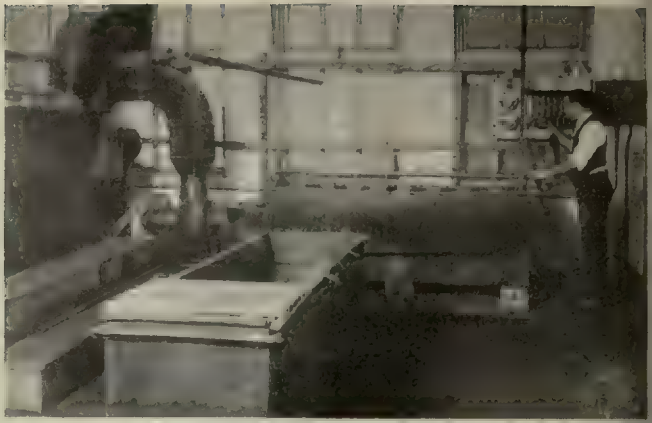
Simple and comparatively inexpensive process offers opportunities for substantial savings in electric railway field

CHROMIUM as a finish on exposed metal has become relatively commonplace of late and its application for wear resistance is rapidly receiving wide recognition. In the electric railway industry it is used considerably for car accessories requiring a non-tarnishable finish and its use has recently been extended to car side and center bearings. Its possibilities for other parts exposed to excessive wear, however, have received comparatively little consideration. Nevertheless it seems likely that the application of chromium to trolley wheels, journal and armature bearings, other wearing surfaces, and even car wheels, may offer many advantages.

Electro-deposited chromium is extremely hard, non-corrosive, immune to alkalies and to most organic acids. It is resistant to atmospheric conditions and is affected by fewer known abrasives than any other metal. Chromium can be applied directly to most metals, and when properly applied produces a product that will wear many times longer than the same base without a coating of chromium. It is not attacked by concentrated nitric acid, aqua regia and cold oil of vitriol. Chromium will also resist weather, sulphur compounds and food acids. Molten tin, one of the most corrosive fluids known, is without effect on chromium.

Considering the diamond as the hardest of any known material and assigning it a value of ten on the Moh hardness scale, chromium is given a value of nine by the same rating, a hardness greater than that of glass. In

Arrangement of tanks for cleaning and deposition of copper and nickel prior to chromium plating. The cleaning tank is in the center. After cleaning, a splash of copper is applied in the tank at the left and then nickel is deposited in the tank in the right background



Removal of fumes is an important part of the process. Fumes from the plating solution in this tank are removed by a suction draft through a series of ports located at the surface of the liquid and drawn through ducts along the sides of the tank to the exhaust fan

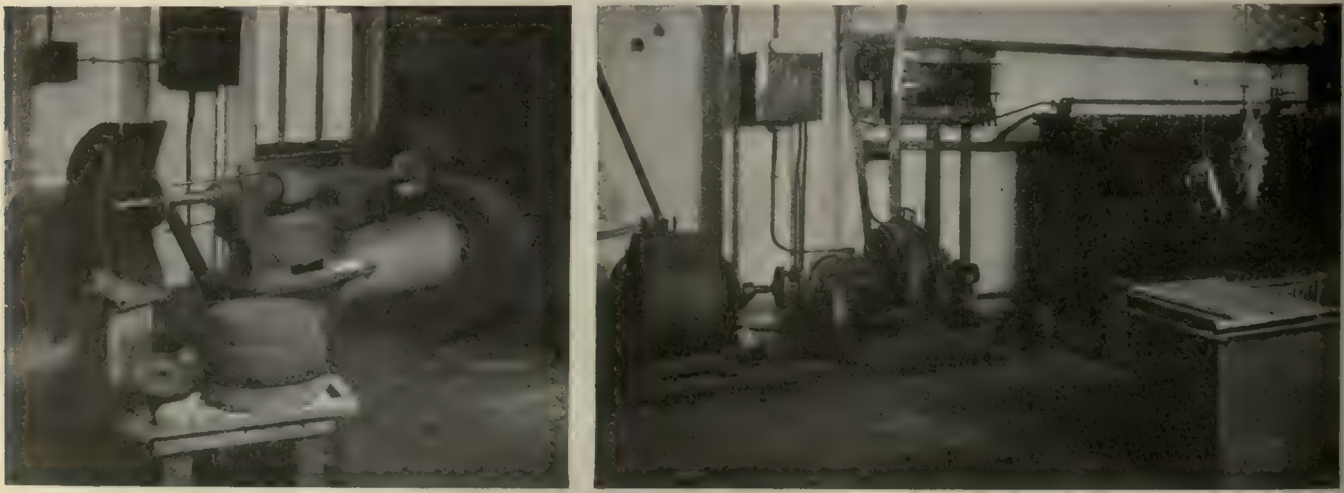
fact, the usual methods and instruments for determining the hardness of metals, the Brinell test and the scleroscope, do not give satisfactory results in measuring the hardness of chromium. The scratch hardness method gives a better idea. The Bierbaum apparatus and the micro-character have been used for this purpose and results indicate that even a soft deposit of chromium plate is harder than case-hardened steel. Chromium also resists oxidation at high temperatures. A temperature of 2,192 deg. F. must be obtained before metallic chromium oxidizes, and its melting point is 2,760 deg. F.

Electro-deposited chromium has been used in several industries to a considerable extent in reducing the wear of mechanical parts. In the automobile industry it is used extensively for coating piston pins so as to increase their life. In this instance the pins are hardened, ground and lapped before plating. This is done automatically, giving a coating of about 0.0001 in. thick on each side. The reason for the pin being prehardened is that it is necessary to support the thin wall of chromium by a strong metal if the part is to stand up in service.

Another use for chromium is in plating brake cams. These are made of drum forged nickel-steel machined all over, carbonized and hardened. Approximately 0.0003 in. of plating is deposited on each side. In a number of instances, chromium plated gears have proved satisfactory and chromium has been used on milling cutters to a considerable extent. The life of gear cutters has been extended from three to five times over the life of flame cutters by chromium plating.

Undoubtedly chromium plating has a wide range of possibilities in its application on electric railway cars. Probably it could be used to advantage to increase the life of journal and armature bearings. Its use is particularly worthy of consideration in building up worn bearings to their original dimensions. As already mentioned, side bearings are now being produced with a deposit of chromium to increase their life. Even the chromium plating of car wheels seems worthy of consideration, although in this instance, the tremendous strain and pounding might limit its use.

In connection with its possible use for trolley wheels, its conductivity must be considered as well as its extreme hardness and tendency to reduce friction. The resistivity of chromium is 2.6×10^{-6} ohm.-cm. This value is practically the same as that for aluminum, and is less than that of other metals except silver, copper and gold. However, that does not necessarily mean that the resistance of a contact between chromium and other metals will be low. In fact, the extreme hardness of chromium might tend to hinder intimate contact, and so reduce its usefulness for trolley wheels.



At left, buffing unit on which objects are polished prior to chromium plating. At right, motor-generator set employed to supply the heavy current required in chromium plating

The methods of procedure in the application of chromium are similar to those attended in the depositions of nickel or copper. If the base metal is iron or steel or die-cast, it is scaled or cleaned, a splash of copper is applied, and it is then immersed in a nickel bath. In some instances the nickel is applied directly to the base metal without first striking the object in the copper. Striking an object is done by placing the object in a bath and then passing the current through for a flash. Great care must be taken that upon entering the nickel bath the object should be chemically clean. An alkaline solution is used to accomplish this. Caustic soda dissolved in hot water makes a good cleaner. The caustic removes whatever grease there may be on the object. Rinsing is also very important. The object should be rinsed in clean water several times after each bath. If it goes into the nickel tank with any particles of dirt or grease clinging to it, the deposit of nickel will peel.

For protection against corrosion a piece of iron or steel is plated in a nickel tank for a duration of from 30 minutes to one hour, depending on the thickness of the coating desired. After the object is taken from the bath completely covered with nickel, it is rinsed and dried. As a bright deposit of chromium usually is desired, the article next enters the polishing room. Here the deposited metal is polished to a degree of smoothness and buffed to a finish. Then it is again cleaned and is ready for the chromium tank.

The object may be left in the chromium tank for a period of from three minutes to three hours, depending on the thickness of the deposit required. Under proper conditions, a three-minute deposit will measure 0.00002 in. This deposit, though very thin and shell-like, will be found to be an impervious metal coating, bright in appearance and hard in substance.

Chromium has been evenly plated by a commercial process up to 0.015 in. in thickness, according to W. N. Phillips of the General Motors Corporation. This deposit was on a ring gage and was very evenly plated. On plug gages about 0.0005 in. of chromium has been found to be a satisfactory thickness.

Friction Between Chromium and Other Metals Usually Very Low

Oil seems to adhere to the surface of chromium in a satisfactory way, and the coefficient of friction between chromium and other metals is usually very low. In testing an automobile fan with a cast-iron bearing and carburized shafting with no lubrication, with a chromium-plated shaft the bearing operated fairly successfully for two hours with very little scuffing, whereas a carburized shaft almost cut out the cast-iron bearing in less than two hours.

Occasionally electroplated chromium has failed to adhere to the base metal under severe conditions of service. According to W. Blum, chemist of the United States Bureau of Standards, its adherence depends on the conditions of deposition, the composition of the base metal, the method of cleaning or preparing the base metal, and the conditions of service. Although the hardness of chromium is said to be produced at relatively high current densities, it has been observed that these chromium deposits may have, on the surface, a network of hairline cracks. It is probable, therefore, that with severe conditions of service, deposits with less than maximum hardness but with slightly greater ductility will be more satisfactory. As a rule, it is more difficult to plate certain of the alloy steels such as those for tools and dies, than to plate carbon steel.

It is the belief of J. M. Braunstein that a thorough and complete knowledge of the process is necessary in order to apply it successfully. The ordinary elements—current density and thermal control—are important factors that require careful study. The concentration of the bath is as important as the temperature at which the bath is used. This knowledge, however, is easily acquired and will enable the inexperienced to apply chromium successfully.

Two convenient methods exist for chromium plating parts used by electric railways. For the larger companies, the most economical plan probably will be to install the necessary equipment in their own shops. For the smaller companies, however, it probably will be cheaper to send out the parts to some commercial chromium plating plant.

Oil in Barrels Should Be Protected from the Weather

By Harold L. Kauffman

Petroleum Consultant, Denver, Col.

RAILWAY maintenance men complain frequently to oil refiners or jobbers who furnish lubricating oils in barrels, that an appreciable quantity of water is found mixed with the lubricant. Precautions taken by oil refiners make it certain that the oil is free from contamination when shipped. How, then, does the water get inside the barrel?

During the past ten years the writer has had occasion to adjust a number of such complaints, and it was found in almost all cases that the barrel of oil had been allowed to stand exposed to the weather. Variations in temperature, together with extremely humid atmospheric conditions, may cause a tightly sealed barrel to "breathe in" water.

As an example, if a closed barrel containing 50 gal. of oil has a certain volume at 65 deg. F., the volume will be greater at 95 deg. F. Hence, as the temperature and volume increase the air above the oil is forced out through the vent plug or bung. If the barrel is stored outside, a rainstorm may result in several quarts of water collecting on the barrel head. When the temperature of the oil decreases a vacuum is created, which draws in some of the water from the head. Under extremely humid atmospheric conditions water may be drawn from the air into the barrel.

This shows the necessity for keeping barrels of oil safely protected from weather conditions. Railway maintenance engineers or others in charge of storage of lubricants for electric railways should make certain that adequate protection is given, and then troubles from the accumulation of water will decrease.

"Quick Transportation for Everyone"

IN a recent advertisement, captioned "What Makes a Public Utility?" the Buffalo *Evening News*, Buffalo, N. Y., compared the service rendered by its classified section to public utility services. The advertisement pays a tribute to the electric railways with the following words: "Street railways mean quick transportation for everyone."

Excellent natural illumination is a feature in this garage of the Worcester Consolidated Street Railway

Large side windows admit plenty of light into the bus repair shop of the Twin City Rapid Transit Company

Bus Maintenance WEL

Survey of garage facilities and practices on 41 electric railway properties emphasizes importance of frequent and regular bus inspection. Structures specially built for garage purposes are favored over remodeled car houses. Careful attention paid to training of personnel

INFORMATION disclosed by a survey made by ELECTRIC RAILWAY JOURNAL covering 41 of the largest bus operating companies in the United States and Canada shows that bus maintenance practices are well standardized. These companies, which operate in all some 6,200 buses, have a total of 141 garages. While many of these garages are remodeled carhouses, the trend of late has been strongly toward the use of buildings specially designed and equipped for bus operation and maintenance. The survey shows that in most instances an ample and well-trained personnel is employed in this work.

From data collected on the size of the garages it appears that an average of 300 to 350 sq.ft. per bus answers the needs on most properties. Although a smaller area would probably be sufficient for mere storage, this amount of space is needed for inspection, cleaning and making minor adjustments while the buses are out of service. Good lighting, which is essential to proper maintenance, has received special attention in the recent design of garages.

A number of railways have garages capable of accommodating from 100 to 200 buses, but the majority appear to favor a capacity of about 40 to 60 buses. The largest garage included in the survey is one belonging to the Department of Street Railways, city of Detroit, where 190 buses can be accommodated in a space 139x498 ft.

The survey shows that a considerable number of companies have remodeled former carhouses to serve as bus garages. Although this procedure undoubtedly possesses certain advantages from the standpoint of economy, the results are not always entirely satisfactory from an operating standpoint. It was pointed out by one large railway bus operator that the ordinary carhouse is too narrow to serve efficiently as a bus garage. There is a marked tendency nowadays to build bus garages more nearly square. Storage of buses over long, continuous pits, such as are found in carhouses, is not considered to be the best practice. On account of their being free-wheel vehicles, great care must be exercised under these conditions in moving them in and out. Moreover, their construction is such that many heavy parts can be removed only by being lifted upward instead of being lowered into the pit, as is customary with street cars. Despite these advantages possessed by buildings specially designed for bus maintenance, the layout and location of various departments in garages continue to reflect strongly the influence of carhouse layout and design.

No general rule is followed with regard to the location of garages in relation to the routes on which the buses operate although the desire to reduce dead mileage to a minimum seems more than anything else to be the determining factor. The majority of operators prefer to have their garages at or near the outer end of the routes, but there are also many who believe that by having the garages in the center of the area served, the buses can be operated with a smaller amount of dead mileage.

FREQUENT INSPECTION NECESSARY

Bus maintenance usually is classified under the four general headings of inspection, adjustment and minor repairs, unit changes, and general overhaul. In most instances the first two are taken care of in the garage, while the last two are performed in some central repair shop which often forms a part of the railway's general car repair shop.

It is generally conceded that inspection is the most important of these four items, because it is the pivot upon which the whole process of maintenance turns. It was shown by the survey that the average inspection period of a bus is about 1,900 miles. The lowest reported was 500 miles on the property of the San Antonio Public Service Company, and the highest was 5,000 miles at St. Louis. With this company, however, the inspection period is the same as the overhaul period. In other words, the company makes no distinction between inspection and overhaul.

STANDARDIZED

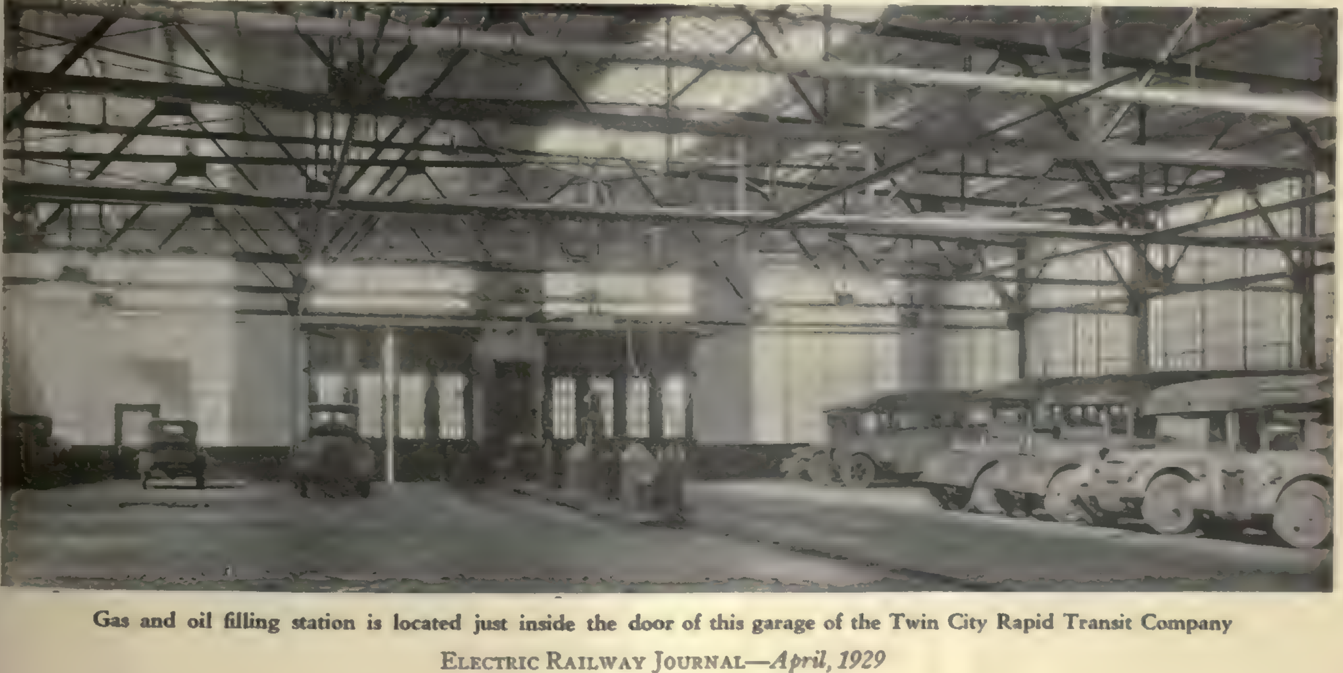
AVERAGE MACHINE TOOL EQUIPMENT OF ELECTRIC RAILWAY GARAGES

One	electric drill	for	every	17	buses
“	lathe	“	“	38	“
“	grindstone	“	“	28	“
“	welding set	“	“	38	“
“	grease pump	“	“	18	“
“	jack	“	“	4	“
“	hoist	“	“	27	“
“	gas pump	“	“	23	“
“	oil pump	“	“	15	“

It was emphasized by several operators that this inspection is not merely a casual examination to see that everything is all right, but that it consists of a thorough examination of engine, chassis and body, as well as tightening up of all bolts and general greasing. Many companies believe that the oil in the crankcase should be drained at this time, although others think it bad practice to wait for general inspections and they advocate oil renewal after every 1,000 miles of service.

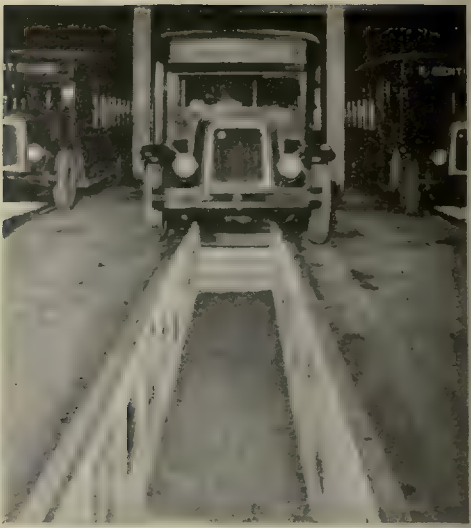
Practice varies concerning night work in garages. Most operators hold the opinion that no heavy repair work should be done at night, but it is thought that minor repairs which are reported by the drivers as being necessary can be performed by the night force, so as to have the bus ready for the morning rush-hour service.

With mechanically-driven buses it appears that the most satisfactory results are obtained when buses are taken off the road for their annual overhaul after about 60,000 miles of service. Most of the maintenance officials consider that after this amount of

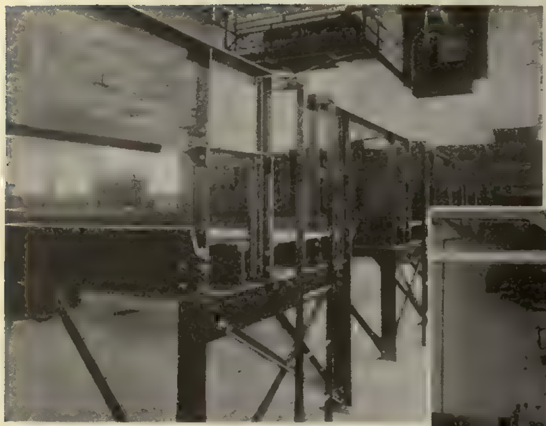


Gas and oil filling station is located just inside the door of this garage of the Twin City Rapid Transit Company

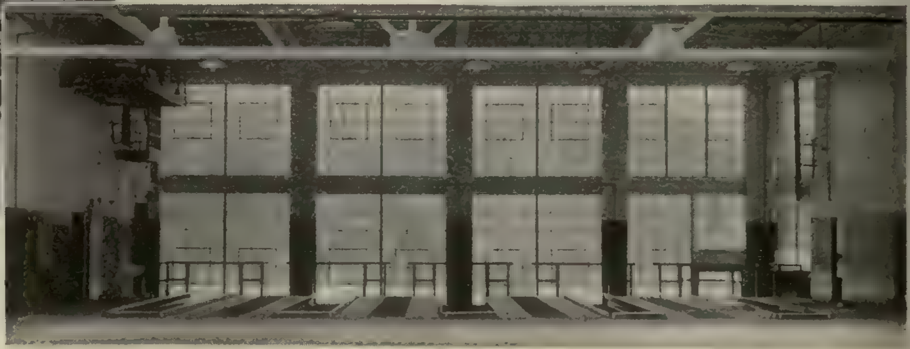
Inspection Facilities of Various Kinds Used in Electric Railway Garages



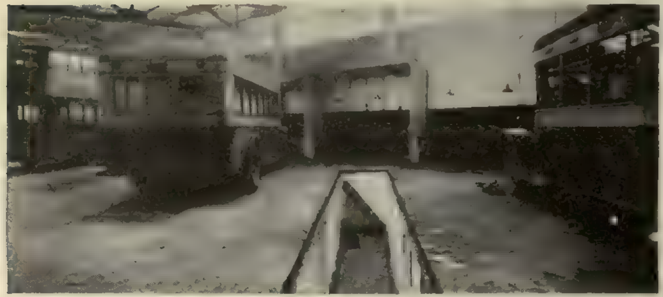
Convenient pit arrangement in bus garage of the New Orleans Public Service, Inc.



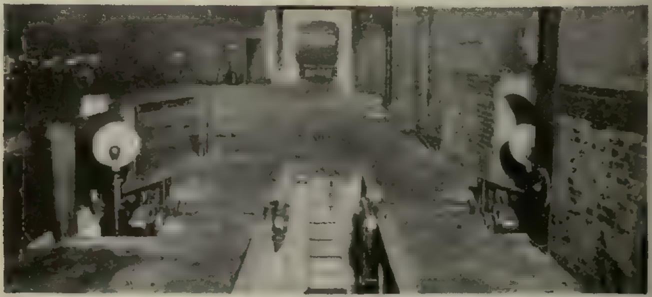
Pit construction in the Dorchester garage of the Boston Elevated Railway is of unusual design with exceptionally good ventilation and light



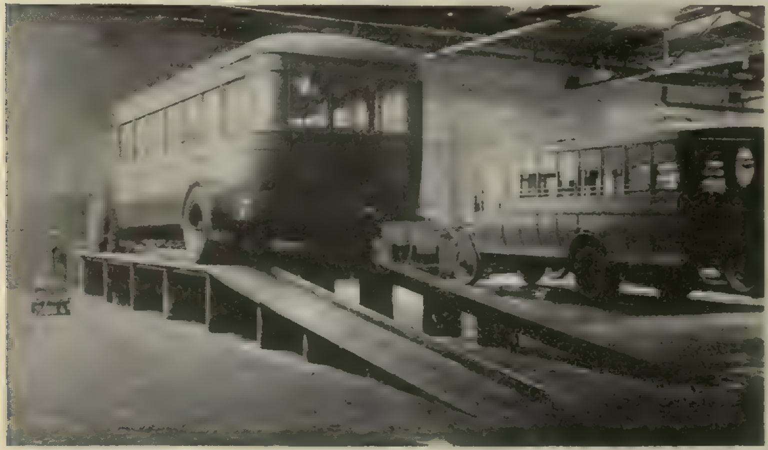
Top view of inspection pit in Dorchester garage of Boston Elevated Railway



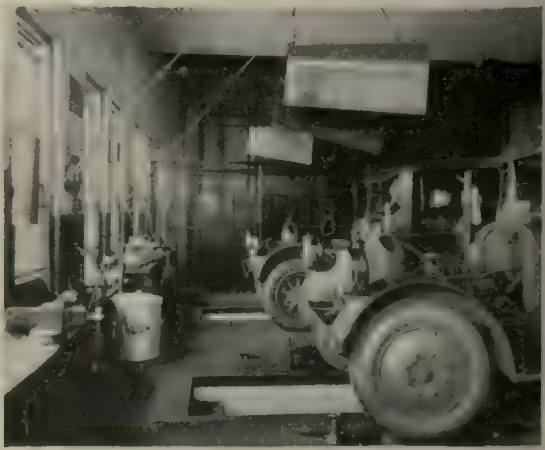
Pits in the new Frankford garage of the Philadelphia Rapid Transit Company are arranged at an angle of 45 deg. with the side walls



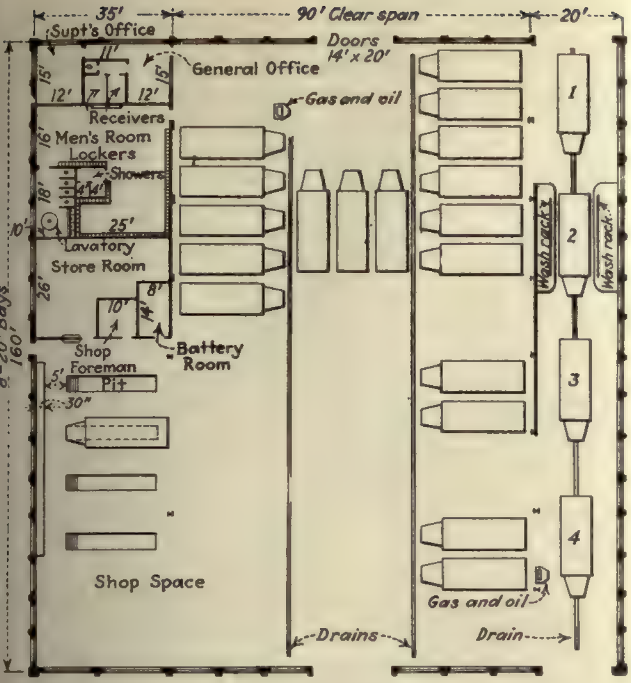
Brake tester and pit in the Charles Street garage of the United Railways & Electric Company of Baltimore



Ramps used instead of pits in one of the Public Service Co-ordinated Transport garages



Ingenious method of raising hood for inspection at Milwaukee



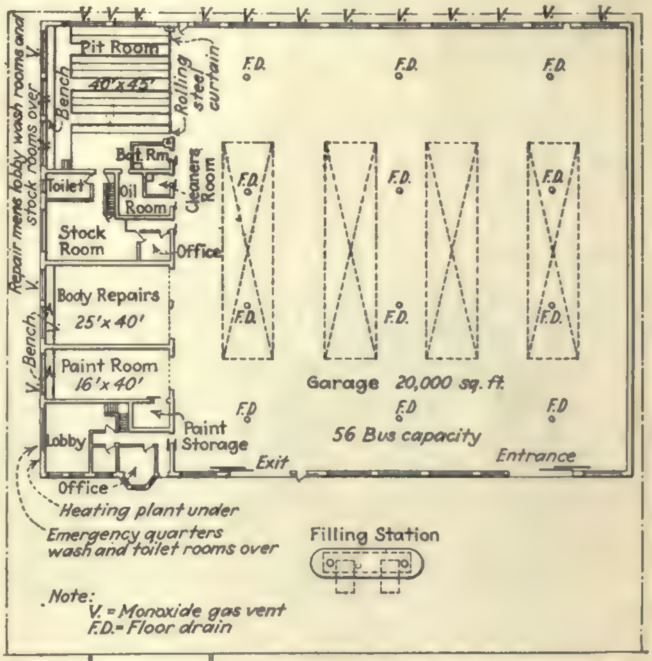
Typical layout for garage to accommodate 45 buses

Bus shower bath in the garage of the Northern Ohio Power & Light Company at Akron

service the vehicle will be badly in need of a fresh coat of paint, and usually the body also needs many repairs for which the garage repair shops are not fully equipped. The maximum overhaul period used by any company included in the survey was 105,000 miles at Springfield, Mass.

It was found that most companies maintain their mechanical-drive buses according to the unit system. In other words, when a unit needs major repairs it is taken out and another unit substituted. After removal the old unit is sent to a central repair shop where experts on that particular kind of work make the necessary repairs. Such replacements usually can be made during the hours that the bus is out of service, thus keeping a maximum number of vehicles on the road for the morning and evening rush hours.

With regard to gas-electric buses, it seems that many operators have not yet ascertained the most satisfactory basis of inspection. Some companies operating gas-electrics are of the opinion that they can be maintained according to the same schedules which govern the upkeep of the mechanically-driven equipment. Kilowatt-hour meters are used frequently as a guide to determine the overhaul period for street cars, however, and this method of determining inspection dates appears to have possibilities for buses also.



Design of garage to accommodate 56 buses as proposed by A.E.R.E.A. committee

Recently built garage of the Virginia Electric & Power Company at Richmond

Summary of Garage Capacities and Personnel

Name of Company	Number of Garages	Names of Garages	Number of Buses	Number of Mechanics	Number of Helpers	Number of Pits
Boston Elevated Railway	5	....	306	66	1	8
Capital Traction Company, Washington	2	Main	37	6	4	2
		Takoma	1	..	..	..
Cincinnati Street Railway	1	....	75	23	17	6
Community Traction Co., Toledo	1	....	125	21	3	5
Connecticut Company	9	....	138	..	..	..
Delaware Electric Power Company	2	No. 1	18	5	..	1
		No. 2	36	12	..	2
Dept. of Street Railways, Detroit	5	Coolidge	104	36	2	5
		Clark	29	9	1	1
		Hercheval	109	45	3	2
		Gary	33	19	1	4
		Second Ave.	190	85	3	2
Eastern Massachusetts Street Railway	6	....	82	..	..	2
Georgia Power Company, Atlanta	1	....	29	4	3	1
Houston Electric Company	1	....	67	15	13	7
Interstate Public Service Company	3	Greenwood	15	8	4	1
		Greenwood	9	..	..	..
		Louisville	6	1	..	1
Kansas City Public Service Co.	1	....	70	..	6	5
Louisville Railway	1	....	40	6	6	2
Miami Beach Railway	1	....	50	7	2	4
Middlesex & Boston St. Ry.	5	Waltham	41	12	6	..
		Auburndale	17	2	3	..
		Natick	13	2	1	..
		Lexington	7	3	..	..
		Hopkinton	4	1	..	..
Milwaukee Electric Railway & Light Co.	2	No. 1	60	21	30	9
		No. 2	52	4	2	4
Montreal Tramways	1	....	98	14	..	3
New Orleans Public Service, Inc.	1	....	37	7	6	5
New York State Railways	6	Rochester	27	8	7	3
		Pittsford	3	1	..	..
		Syracuse	19	6	6	2
		Utica	11	3	4	1
		Rome	4	1	..	..
		Dodgeville	5	1	..	..
Northern Ohio Power & Light Co.	5	Kenmore	103	43	5	..
		Central	90	33	10	..
		Brittain	19	7	2	..
		Canton	39	11	5	..
		Dover	4	1	1	..
Penn-Ohio System	4	Youngstown	85	21	14	8
		Cleveland	8	4	1	1
		Warren	14	1	3	..
		New Castle	5	1	1	..
Philadelphia Rapid Transit Co.	8	No. 1	175	..	..	14
		No. 2	125	..	..	10
		No. 3	106	..	..	9
		No. 4	140	..	..	12
		No. 5	75	..	..	6
		No. 6	27	..	..	2
		No. 7	12	..	..	1
		No. 8	9	..	..	1
Pittsburgh Railways	2	Lexington	50	27	6	..
		Northside	20	6	3	..
Potomac Edison Company, Hagerstown, Md.	2	No. 1	20	8	4	1
		No. 2	10	3	2	..
Portland Electric Power Company	1	....	40	15	..	For 10 buses
Pub. Serv. Co-Ordinated Transport (New Jersey)	33	....	1,781	..	..	..
St. Louis Public Service Co.	2	No. 1	27	5	3	2
		No. 2	25	15	6	3
San Antonio Public Service Co.	1	....	75	18	..	5
Seattle Municipal Railway	2	No. 1	22	4	3	1
		No. 2	21	5	1	2
Springfield Street Railway (Mass.)	3	Bond Street	34	5	3	..
		Westfield	7	1	1	..
		Palmer	5	1	..	..
Terre Haute, Indianapolis & E. Traction Co.	1	....	19	6	3	..
Third Ave. Railway, New York	1	....	125	..	..	11
Toronto Transp. Commission	4	Davenport	90	22	9	3
		Howard Pk.	46	2	2	1
		Sherbourne	13	3	5	1
		Hamilton	6	2	1	..
Twin City Rapid Transit Co., Minneapolis	3	No. 1	69	38	5	3
		No. 2	25	..	..	..
		No. 3	7	..	..	..
United Elec. Ry., Providence	2	Providence	72	44	..	..
		Woonsocket	19	6	..	2
United Railways & Elec. Co., Baltimore	2	Center	58	36	..	4
		Outer End	41	19	..	..
United Traction Co., Albany	2	Troy	30	9	3	4
		Albany	46	24	3	7
Virginia Elec. & Power Co.	4	Richmond	80	21	11	3
		Norfolk	80	26	12	1
		Portsmouth	30	5	3	..
		Petersburg	8	1	1	..
Washington Ry. & Elec. Co.	2	No. 1	92	12	17	2
		No. 2	4	..	..	1
Winnipeg Electric Co.	1	....	48	8	12	1
Worcester Con. St. Ry.	3	Grove Street	42	15	6	4
		S. Bridge	14	3	2	..
		Uxbridge	8	2	..	..
Total	141		6,176	...	...	...

The Philadelphia Rapid Transit Company has obtained particularly good results with this system. Although the kilowatt-hour inspection plan was originally instituted for the electrical equipment only, it has been found also to be a good guide for the maintenance of the mechanical parts of gas-electric buses. After a bus has run an equivalent of 2,500 kw.-hr. it receives a general inspection similar to that given to a mechanically-driven bus, and in addition an examination of all connections of the electrical equipment. These inspections are repeated every 2,500 kw.-hr., until a total of 35,000 kw.-hr. has been reached, when the electrical units are removed from the vehicle and subjected to a thorough inspection to see that all insulated parts, commutator and field coils, etc., are in perfect running condition. This process is repeated until the meter records 105,000 kw.-hr., when the bus is given a general overhaul and a new coat of paint is applied. The same cycle then begins anew and continues until the bus has been in service amounting to a total of 210,000 kw.-hr., when it is considered that major improvements should be made in order to avoid approaching obsolescence.

MACHINE TOOL EQUIPMENT

From the figures of the companies included in this survey it is evident that the machine tool equipment of the garages is ample, particularly with respect to the smaller apparatus such as jacks, grease pumps, grinding stones and hoists. The larger tools, such as lathes, electric drills, and welding sets, are usually confined to those garages which do heavy repair work and, of course, to the central repair shops. The average number of buses served by each tool is shown in an accompanying table.

With regard to the number of pits required in a garage there seems to be a wide variety of opinion. The survey indicates, however, that on an average one pit for every sixteen buses will be adequate for the ordinary run of maintenance work. Although the latest design of pits is well arranged with respect to ventilation, many maintenance men believe that ramps provide greater safety from carbon monoxide poisoning as well as better lighting. On the other hand, pits can be more easily provided with shelves for small tools. The construction of ramps is usually cheaper than that of pits. It is necessary, however, to have a somewhat larger space available where ramps are used, as inclined approaches are necessary.

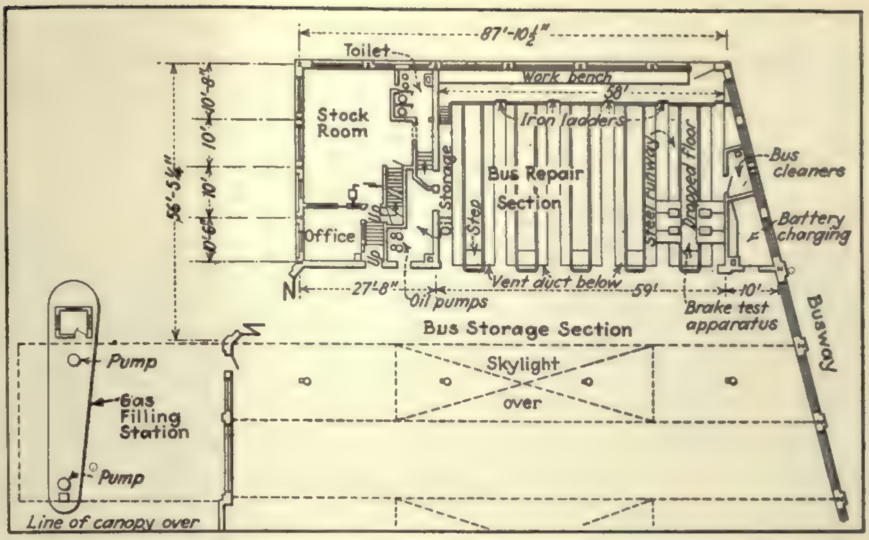
The survey shows that there is a marked preference for separating the repair shop for buses from the car shop. The majority of railways also have separate maintenance personnel for buses and cars even where they operate gas-electric vehicles. A type of organization frequently found is that where one foreman is in charge of bus maintenance and a second foreman in charge of car maintenance, both reporting to a general foreman.

TRAINING OF PERSONNEL IMPORTANT

The personnel engaged in bus maintenance work at the garages covered in this survey averages about four men for every ten buses. Of this number three are mechanics and one is a mechanic's helper. Some companies, however, say that they do not differentiate between mechanics and helpers.

Training of mechanics for bus maintenance work is considered to be a very serious problem. The natural training school for these men seems to be in factory work in allied trades. Formerly this was the source from which most of the bus mechanics came, but in recent years the demand has become greater than the available supply and many railways now train their own mechanics. This has been found advantageous due to the fact that with mass production methods in the larger factories the mechanics do not receive the all-around training which they used to get, and hence come to the garages familiar with only one or two parts of the vehicle. The survey shows that a majority of railways prefer to train their own mechanics, due partly, perhaps, to the fact that necessity compels them to follow this course but influenced also by the fact that a mechanic who has been trained elsewhere often is hard to change to the standards required in railway bus maintenance.

Not the least important among the facilities for maintenance and repair of buses is the garage storeroom. In 48 garages on the 41 railway properties included in the survey the average size of storeroom was found to be slightly under 1,000 sq.ft. A total of some 3,000 buses are housed in these 48 garages, making the average amount of storeroom space provided about 16 sq.ft. per bus. In a few instances the companies use the railway storeroom for holding bus material and supplies also, although most companies prefer to have separate storerooms. The largest storeroom in any garage included in the survey is that of the Second Avenue garage of the Department of Street Railways, Detroit, which has an area of 4,400 sq.ft., or about 22 sq.ft. per bus.

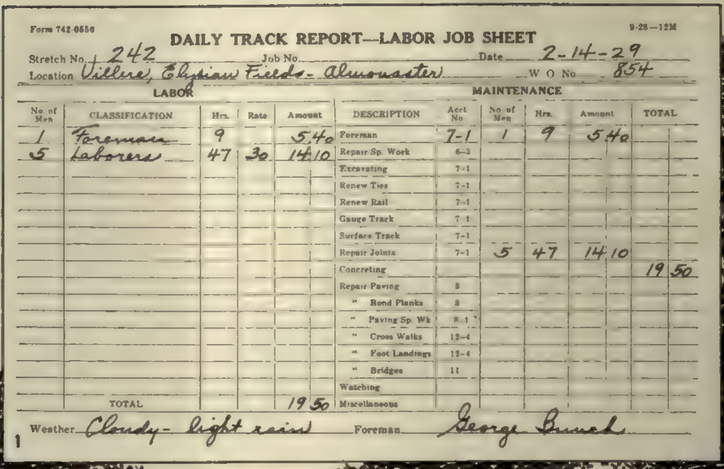


Arrangement of new Dorchester garage of Boston Elevated Railway

Outside filling station of the Virginia Electric & Power Company at Richmond

Recently built Lake Street garage of Public Service Co-ordinated Transport

Report Forms Used by New Orleans Public Service, Inc., for Track Inspection and Maintenance Work



Form 742-0656 9-28—12M

DAILY TRACK REPORT—LABOR JOB SHEET

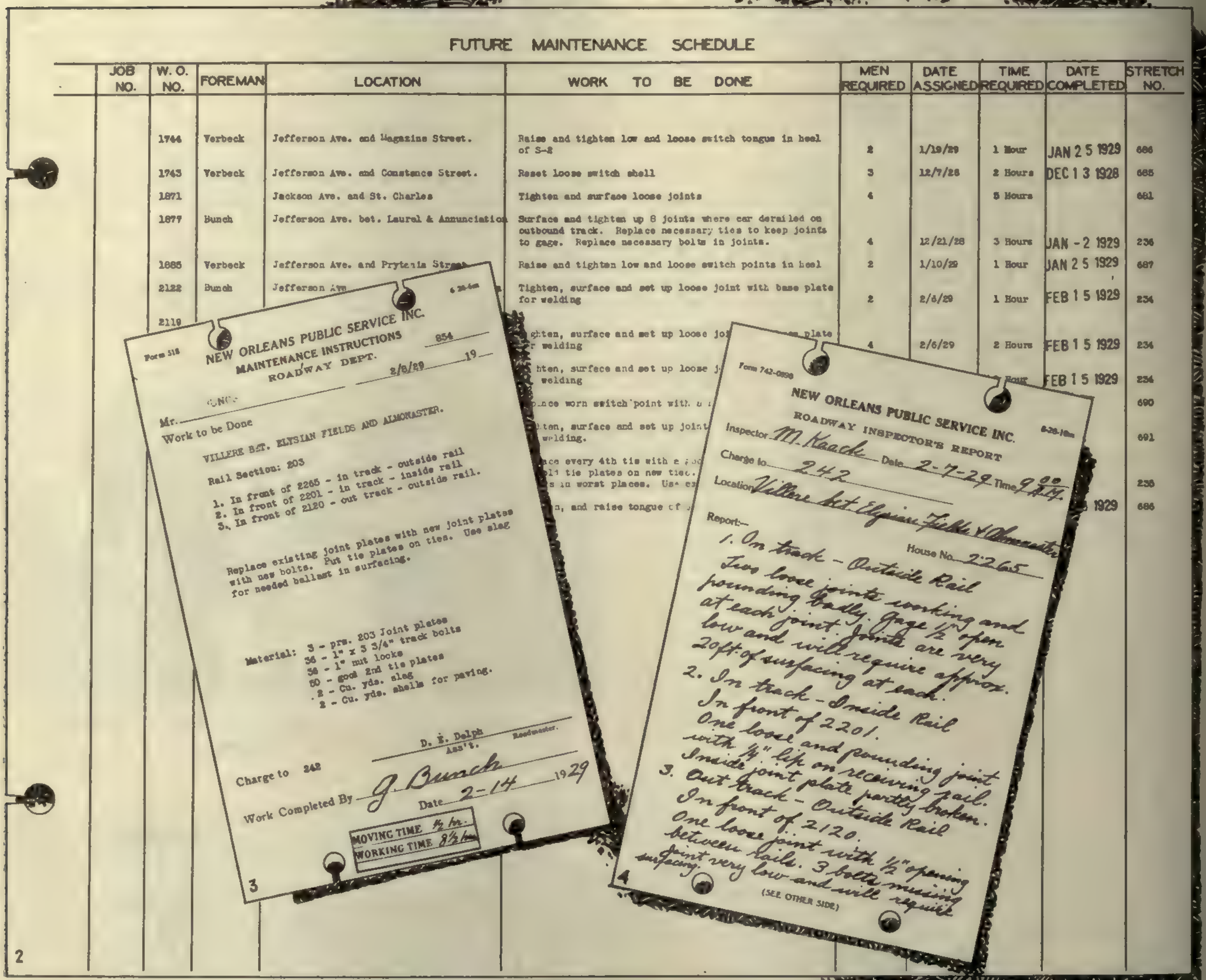
Stretch No. 242 Job No. Date 2-14-29

Location Villere, Elysian Fields - Almonaster W O No. 854

LABOR					MAINTENANCE					
No. of Men	CLASSIFICATION	Hrs.	Rate	Amount	DESCRIPTION	Acct No	No. of Men	Hrs.	Amount	TOTAL
1	Foreman	9		5 40	Foreman	7-1	1	9	5 40	
5	Laborers	47	30	14 10	Repair Sp. Work	6-3				
					Excavating	7-1				
					Renew Ties	7-1				
					Renew Rail	7-1				
					Gauge Track	7-1				
					Surface Track	7-1				
					Repair Joints	7-1	5	47	14 10	
					Concreting					19 50
					Repair Paving	8				
					" Bond Planks	8				
					" Paving Sp. Wk	8-1				
					" Cross Walks	12-4				
					" Foot Landings	12-4				
					" Bridges	11				
					Watching					
	TOTAL			19 50	Miscellaneous					

Weather Cloudy - light rain Foreman George Bunch

1



FUTURE MAINTENANCE SCHEDULE

JOB NO.	W. O. NO.	FOREMAN	LOCATION	WORK TO BE DONE	MEN REQUIRED	DATE ASSIGNED	TIME REQUIRED	DATE COMPLETED	STRETCH NO.
	1744	Verbeck	Jefferson Ave. and Magazine Street.	Raise and tighten low and loose switch tongue in heel of S-2	2	1/19/29	1 Hour	JAN 25 1929	686
	1743	Verbeck	Jefferson Ave. and Constance Street.	Reset loose switch shell	3	12/7/28	2 Hours	DEC 13 1928	685
	1871		Jackson Ave. and St. Charles	Tighten and surface loose joints	4		5 Hours		661
	1877	Bunch	Jefferson Ave. bet. Laurel & Annunciation	Surface and tighten up 8 joints where car derailed on outbound track. Replace necessary ties to keep joints to gage. Replace necessary bolts in joints.	4	12/21/28	3 Hours	JAN -2 1929	236
	1885	Verbeck	Jefferson Ave. and Prytania Street	Raise and tighten low and loose switch points in heel	2	1/10/29	1 Hour	JAN 25 1929	687
	2122	Bunch	Jefferson Ave	Tighten, surface and set up loose joint with base plate for welding	2	2/6/29	1 Hour	FEB 15 1929	234
	2119			ghten, surface and set up loose jo plate r welding	4	2/6/29	2 Hours	FEB 15 1929	234
				hten, surfece and set up loose j welding			Hour	FEB 15 1929	234
				ace worn switch point with u					690
				ten, surface and set up joint welding.					691
				ace every 4th tie with a l tie plates on new tiec. s in worst places. Use ex					236
				n, and raise tongue of				1929	686

2

Form 518 6-28-6m

NEW ORLEANS PUBLIC SERVICE INC.

MAINTENANCE INSTRUCTIONS

ROADWAY DEPT.

854

2/8/29 19

Mr. GNC

Work to be Done

VILLERE BET. ELYSIAN FIELDS AND ALMONASTER.

Rail Section: 203

1. In front of 2265 - in track - outside rail
2. In front of 2201 - in track - inside rail
3. In front of 2120 - out track - outside rail.

Replace existing joint plates with new joint plates with new bolts. Put tie plates on ties. Use slag for needed ballast in surfacing.

Material:
3 - prs. 203 Joint plates
36 - 1" x 3 3/4" track bolts
36 - 1" nut locks
50 - good 2nd tie plates
2 - Cu. yds. slag
2 - Cu. yds. shells for paving.

D. E. Delph Roadmaster. Ass't.

Charge to 242

Work Completed By G. Bunch

Date 2-14 1929

MOVING TIME ½ hr.
WORKING TIME 8½ hrs.

3

Form 742-0690 6-28-10m

NEW ORLEANS PUBLIC SERVICE INC.

ROADWAY INSPECTOR'S REPORT

Inspector M. Kaack Date 2-7-29 Time 9⁰⁰ A.M.

Charge to 242

Location Villere bet Elysian Fields & Almonaster

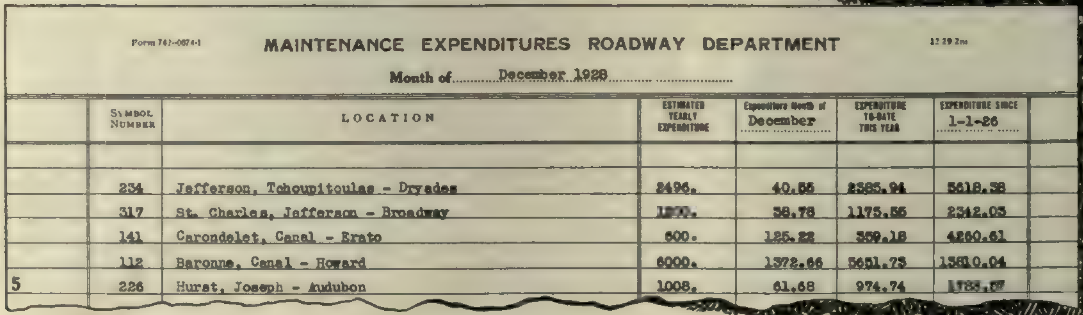
Report:—

House No. 2265

1. On track - Outside Rail
Two loose joints working and pounding badly. Gage ½" open at each joint. Joints are very low and will require approx. 20 ft. of surfacing at each.
2. In track - Inside Rail
In front of 2201.
One loose and pounding joint with ¼" lip on receiving rail. Inside joint plate partly broken.
3. Out track - Outside Rail
In front of 2120.
One loose joint with ½" opening between rails. 3 bolts missing joint very low and will require surfacing.

(SEE OTHER SIDE)

4



Form 742-0674-1 12 29 2m

MAINTENANCE EXPENDITURES ROADWAY DEPARTMENT

Month of December 1928

	SYMBOL NUMBER	LOCATION	ESTIMATED YEARLY EXPENDITURE	Expenditure Month of December	EXPENDITURE TO-DATE THIS YEAR	EXPENDITURE SINCE 1-1-26
	234	Jefferson, Tchoupitoulas - Dryades	2496.	40.55	2385.94	5618.38
	317	St. Charles, Jefferson - Broadway	1200.	38.78	1175.55	2342.05
	141	Carondelet, Canal - Erato	600.	125.22	359.18	4260.61
	112	Baronne, Canal - Howard	6000.	1372.66	5651.73	13610.04
5	226	Hurst, Joseph - Audubon	1008.	61.68	974.74	[illegible]

Field paving maintenance unit at work. Truck carries paving materials and hauls oil-burning combined tar kettle and sand drier

Detailed Analysis of TRACK COSTS *Promotes Economy*

Street railway trackage in New Orleans is classified according to type and age of construction and accurate records are kept of all expenditures. These figures permit determination of most economical designs and methods

By

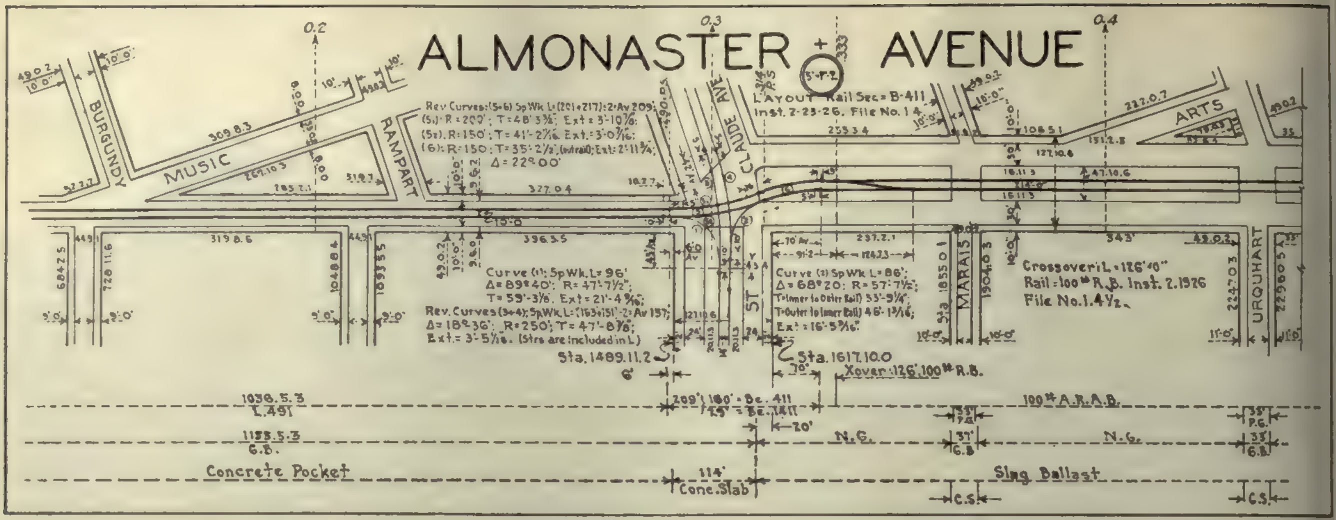
I. O. MALL

Assistant Superintendent of Roadway
New Orleans Public Service, Inc.

EXPENDITURES for the construction and maintenance of tracks are a factor of prime importance in electric railway operation, as analysis shows that the investment in permanent roadbeds, in general, comprises one-half or more of the entire property investment. Intelligent analysis of track maintenance costs is dependent upon a record of such nature that a detailed study can be made of the expenditures. Track costs, when recorded under the usual classification of accounts established by the I.C.C., are merely a group of figures that permit of balanced bookkeeping. This system does not permit of analysis and affords a convenient means for covering up expensive mistakes.

Due to the absence of recognized standards of track design in the past the average operating company has acquired numerous types of construction through its period of development. When the total maintenance cost is spread over the net mileage of such a variable track system it is impossible to analyze performance. Unless maintenance methods and cost records are given detailed attention and kept under complete control, it is inevitable that large sums of money will be wasted that might otherwise be made productive. Efficient operation requires that the roadbed be designed, built and maintained in a manner that assures an economic life commensurate with the investment. It is imperative, therefore, that a co-ordinated system of maintenance methods and cost records be utilized.

With this thought in view there have been developed in the roadway department of the New Orleans Public Service, Inc., methods and records that furnish a basis for investigating the economical aspects of track construction and maintenance. The track system is divided into track stretches. The limits of the stretches are variable, being governed by type and age of construction, and terminated at points where service is duplicated.


ALMONASTER AVENUE
0.2
0.3
0.4
BURGUNDY
MUSIC
RAMPART
CLAUDE AVE
ST
MARAIS
ARTS
URQUHART
Rev Curves:(5+6) SpWk L:(201+217):2:Av 209;
(5₁): R = 200'; T = 48' 3¾"; Ext = 3'-10⅞;
(5₂). R: 150'; T = 41'-2⅞; Ext.: 3'-0⅞;
(6): R: 150; T = 35'-2½" (outrail); Ext: 2'-11¾";
Δ = 22°00'
Curve (1); SpWk. L = 96'
Δ = 89°40'; R = 47'-7½";
T = 59'-3⅛. Ext = 21'-4⁹⁄₁₆;
Rev. Curves (3+4); SpWk. L: (163+151)-2 = Av 157;
Δ = 18°36'; R = 250'; T = 47'-8⅞";
Ext. = 3'-5⁹⁄₁₆. (Strs are included in L)
Sta. 1489.11.2
LAYOUT Rail Sec = B-411
Inst. 2-23-26. File No. 14
Curve (2) SpWk L = 86';
Δ = 68°20: R = 57'-7½";
T (Inner to Outer Rail) 35'-9¼";
T (Outer to Inner Rail) 46'-1³⁄₁₆;
Ext = 16'-5⁹⁄₁₆"
Crossover: L = 126'0"
Rail = 100# R.B. Inst. 2.1926
File No. 1.4½
Sta. 1617.10.0
Xover: 126' 100# R.B.
1030.5.3
L.491
1133.5.3
G.B.
Concrete Pocket
209' 180' = Bc. 411
25' = Bc. 1411
20'
114'
Conc. Slab
100# A.R.A.B.
N.G.
P.G.
G.B.
Slag Ballast
C.S.

Alignment drawing gives complete picture of physical features of track structure

This latter feature allows the maintenance cost to be properly proportioned to each of the car lines on tracks where service is duplicated. Each track stretch is designated by a symbol location number, which appears on all orders and records pertaining thereto.

A plan record of construction, commonly known as an "alignment drawing," showing a complete picture of the physical track structure in the street, is available for reference in studying stretch maintenance costs. This drawing defines and locates intersecting streets, lineal distances, cross-sectional street dimensions, types of construction, materials of construction, all represented in such a manner as to afford a basis for analysis.

Assignment of repair work is based upon a system of thorough track inspection. Tangent track mileage is segregated into divisions and a track inspector is responsible for reporting the condition of the track in each division. The inspector makes his observations while riding the cars and supplements his notes with a careful examination made while walking along the track and watching conditions under car operation. A written report is made of all track defects and conditions. These inspection reports are forwarded to the assistant roadmaster in charge of maintenance operations.

The assistant roadmaster conducts tri-weekly meetings with the track inspectors, at which time the inspection reports are thoroughly discussed. The repair jobs are separated and classified in accordance with the urgent need of repairs. The consecutive order in which the jobs are to be executed is recorded on the "Future Maintenance Schedule." Sufficient work is outlined in advance to keep each maintenance unit busy for at least two weeks.

Every maintenance job, whether of minor or major proportions, is performed with a "Maintenance Work Order." This work order gives a complete description of the work to be done and specific directions and instructions for doing the work. It shows the track stretch symbol location that the work is to be charged to. In the assignment of jobs an effort is made to group work of a similar nature, in order that the maintenance units may become specialized. Each maintenance unit consists of an automobile truck and a trailer tool cart, properly equipped to do the required work. When a job is completed the maintenance work order is checked and the job removed from the future maintenance schedule.

The foreman of each maintenance unit makes a daily "Labor Distribution Report." This report indicates the

Field track maintenance unit at work. Foreman discussing features of work with supervisor total charge against the particular track stretch, as designated by the track stretch symbol number. The labor charges are distributed in accordance with the conventional classification of accounts, which enables the accounting department to keep books on this basis. Material and supply issues also carry the track stretch symbol, which completes the total charge accumulated on a given job.

Track inspector using straight edge gage on frog to determine extent of wear or cupping and alignment and condition of center insert

Track inspector observing effect on track of passing car watching for track movement and listening for impact noises

Track expenditures are budgeted yearly in advance. The probable amount of money required is determined after a thorough study of the physical condition of the track. The assistant roadmaster in charge of maintenance operations, with the aid of the track inspectors, develops an intimate knowledge of track conditions. This information enables him to specify within very close limits the amount of money necessary to meet standard maintenance requirements. A cumulative statement of "Monthly Maintenance Expenditures" is prepared which shows the budget performance. At the end of each month a general meeting of the supervising personnel and maintenance unit foremen is held, at which the track stretch cost record is analyzed in detail. Variable or excessive costs, as brought out by this statement, are given special attention, together with a complete analysis of all work performed on the track stretch in question. This discussion also provides the basis for an efficient study of maintenance methods and measures the relative efficiency of different types of track construction.

Maintenance procedure, that detects failures or defects in the track structure and completes the necessary repairs while these defects are of a minor nature, minimizes the net maintenance cost. Such a procedure is possible and practical when based upon a system of regular and thorough inspection.

Advance scheduling and assignment of work eliminates delays and lost time that usually occur when work is assigned without planning. The information furnished by track inspection forms a specific basis for planning a schedule of maintenance work, so outlined as to employ the minimum of maintenance forces efficiently.

The most careful scheduling and planning of work may be of no avail unless a very rigid follow-up system of checking is employed. Adherence to instructions, quality of workmanship and efficiency of performance can be gained only by applying a systematic follow-up check on each and every assigned job.

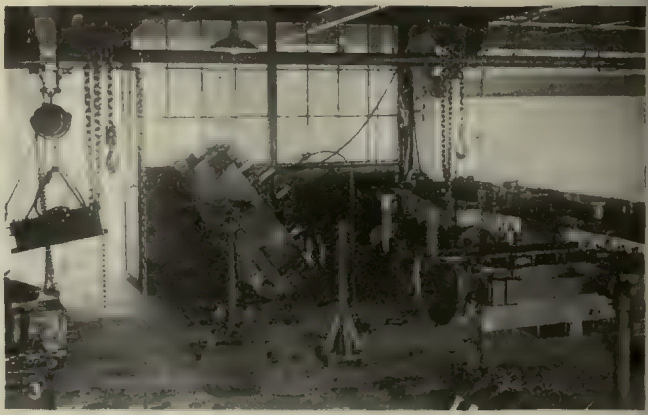
Improvement of maintenance methods and practices can only be gained by comparative study and application. These methods and practices are an important factor in track costs. Obsolete or old-fashioned methods will soon be abandoned when competing with modern practices developed through the analysis of proper cost records.

In making minor repairs developed practices give very little consideration to the quality of workmanship required. It is a difficult problem to educate foremen and laborers to the fact that the success of minor repairs is dependent upon high standards of workmanship. A system that provides a record of job performance creates an atmosphere of respect for the work performed and is, therefore, a conducive factor in developing the best standards of workmanship.

The written and filed record of track maintenance costs, in conjunction with a description of the work done, is of particular value in the study of track performance. This record shows when operating costs reach an amount that justifies reconstruction of the track. Comparative studies of maintenance costs, as related to types of track design, afford a basic guide for the selection of the type of track design that should be used in future construction work.

Co-operation

between departments is an important factor in bus maintenance at Toronto



No. 1. Upper floor of Davenport garage, which has a clear space 66 ft. wide.

No. 2. Overhauling chassis at Davenport garage.

No. 3. Bus engines are removed and taken to this room for repairs.

No. 4. Hydraulic refueling system is used at the Davenport garage.

No. 5. Checking up water, signs, seats, etc., before bus leaves garage.

No. 6. Driver opening air-operated garage door without leaving his seat in the bus.

No. 7. Typical bus inspection pit in T.T.C. garage.

Overhauling bus bodies at the Hillcrest general shops of the Toronto Transportation Commission

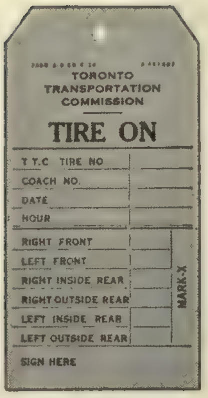
Accurate Garage Records
Insure Reliable Bus Performance

By
A. S. McARTHUR
General Superintendent Toronto Transportation Commission

VARIOUS departments co-operate in the maintenance work for the 81 buses, 90 coaches and 63 trucks and service vehicles operated by the Toronto Transportation Commission. Body repairs and painting for these 234 vehicles are carried out at the Hillcrest general shops by the rolling stock department. Chassis and engine repairs are made by the garage department at Davenport garage. This department also looks after the inspections and overhaul schedules, and all preparation of vehicles for service at four garages in Toronto and one in Hamilton. All battery repairs are done by the electrical department at the Yonge Street substation, but batteries are charged at three garages. In all of this work the keeping of accurate records plays an important part.

For the operation and maintenance of its large fleet of automotive vehicles the T.T.C. owns four garages and rents one. Howard Park garage was built in 1921, and will accommodate twelve large vehicles. It is located on the west side of the city and is equipped with facilities for all regular maintenance work but not for major repairs. The Hillcrest emergency garage was completed in 1923, primarily for overhead tower, emergency and service trucks. It is located almost in the center of Toronto and accommodates eighteen trucks. Davenport garage on the northwest corner of the Hillcrest yards property was opened in 1925 and accommodates 100 vehicles on two floors. The upper floor is at street level and the lower at the yard level, to which a ramp leads down from Davenport Road at the west end outside the

Spray painting at Hillcrest shops. "Bus" bodies are painted red, while "coaches" are painted in two-tone gray



TORONTO
TRANSPORTATION
COMMISSION

TIRE ON

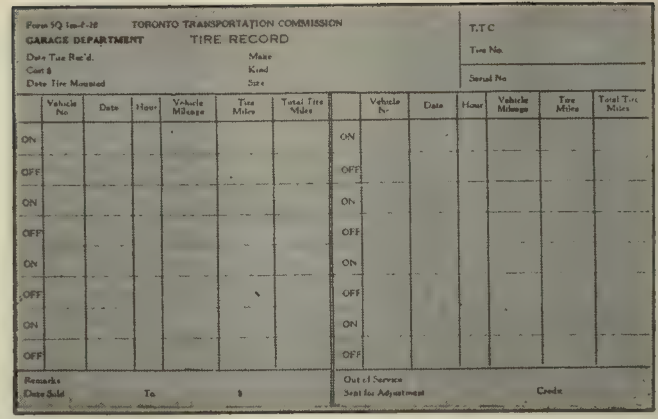
T.T.C TIRE NO	
COACH NO.	
DATE	
HOUR	
RIGHT FRONT	
LEFT FRONT	
RIGHT INSIDE REAR	
RIGHT OUTSIDE REAR	
LEFT INSIDE REAR	
LEFT OUTSIDE REAR	

MARK-X

SIGN HERE

Tire Card

When a tire is removed from service or placed in service this card is filled in by the tire staff and entered on tire records by office staff.



TORONTO TRANSPORTATION COMMISSION
GARAGE DEPARTMENT
TIRE RECORD

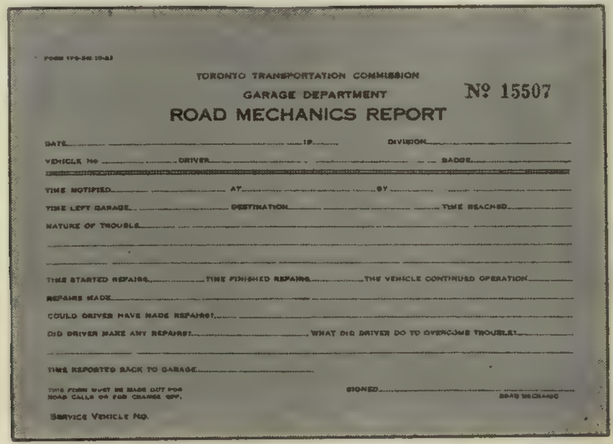
Date Tire Rec'd.
Cost $
Date Tire Mounted
Make
Kind
Size
T.T.C
Tire No.
Serial No.

	Vehicle No.	Date	Hour	Vehicle Mileage	Tire Miles	Total Tire Miles		Vehicle No.	Date	Hour	Vehicle Mileage	Tire Miles	Total Tire Miles
ON							ON						
OFF							OFF						
ON							ON						
OFF							OFF						
ON							ON						
OFF							OFF						
ON							ON						
OFF							OFF						

Remarks
Date Sold To $
Out of Service
Sent for Adjustment Credit

Tire Record

When a tire is placed in service or any change made to it, a record is transferred to this card from the "Tire On" and "Tire Off" card, and the mileage entered from the mileage book.

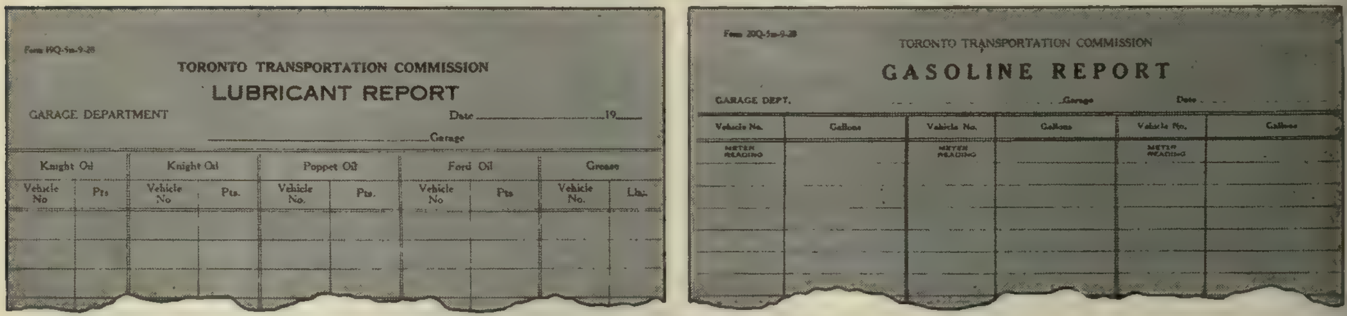


TORONTO TRANSPORTATION COMMISSION
GARAGE DEPARTMENT
ROAD MECHANICS REPORT
Nº 15507

DATE 19 DIVISION
VEHICLE NO. DRIVER BADGE
TIME NOTIFIED AT BY
TIME LEFT GARAGE DESTINATION TIME REACHED
NATURE OF TROUBLE
TIME STARTED REPAIRS TIME FINISHED REPAIRS THE VEHICLE CONTINUED OPERATION
REPAIRS MADE
COULD DRIVER HAVE MADE REPAIRS?
DID DRIVER MAKE ANY REPAIRS? WHAT DID DRIVER DO TO OVERCOME TROUBLE?
TIME REPORTED BACK TO GARAGE
THIS FORM MUST BE MADE OUT FOR ROAD CALLS OR FOR CHANGE OFF.
SIGNED
ROAD MECHANIC
SERVICE VEHICLE NO.

Road Mechanic's Report

When a "trouble" call is received at the garage, the person taking the call enters on this report the time and destination of the bus and the nature of the trouble. The mechanic making the repairs fills in the rest of the form and turns in the completed report to the garage foreman.



Form 19Q-5m-9-28

TORONTO TRANSPORTATION COMMISSION
LUBRICANT REPORT
GARAGE DEPARTMENT
Date 19
Garage

Knight Oil		Knight Oil		Poppet Oil		Ford Oil		Grease	
Vehicle No	Pts	Vehicle No	Pts.	Vehicle No.	Pts.	Vehicle No	Pts	Vehicle No.	Lbs.

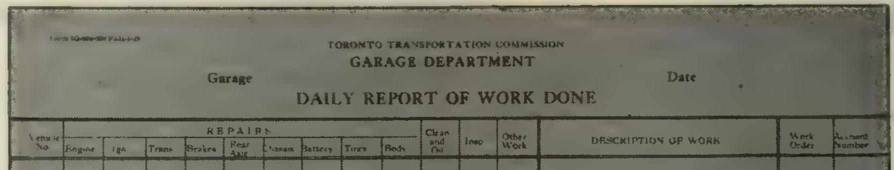
Form 20Q-5m-9-28

TORONTO TRANSPORTATION COMMISSION
GASOLINE REPORT
GARAGE DEPT. Garage Date

Vehicle No.	Gallons	Vehicle No.	Gallons	Vehicle No.	Gallons
METER READING		METER READING		METER READING	

Lubricant and Gasoline Reports

These are made up by the floorman on each shift, checked and entered in records in the office.

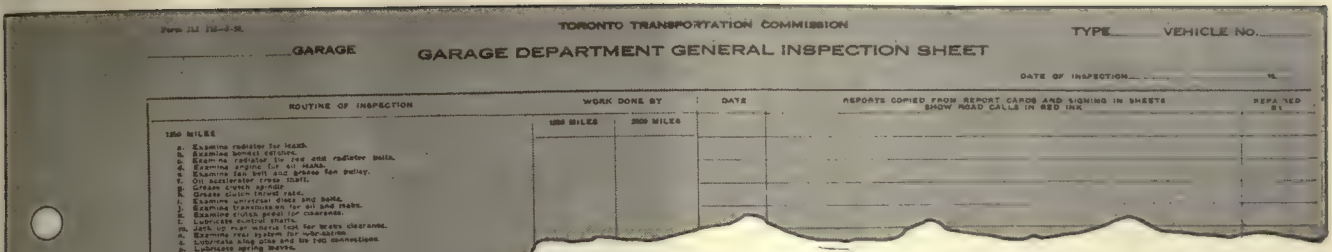


TORONTO TRANSPORTATION COMMISSION
GARAGE DEPARTMENT
Garage Date
DAILY REPORT OF WORK DONE

Vehicle No.	REPAIRS									Clean and Oil	Insp.	Other Work	DESCRIPTION OF WORK	Work Order	Account Number
	Engine	Ign.	Trans.	Brakes	Rear Axle	Chassis	Battery	Tires	Body						

Daily Report of Work Done

These are made out by mechanic, turned in to timekeeper, who sorts them and gives them to garage foreman, who in turn gives them to the gang foremen for their O.K. After this they are turned over to the timekeeper to be allotted account numbers and time distribution. Garage foreman finally checks the time sheets with the repair cards.



Form 112 TB—3—28.

TORONTO TRANSPORTATION COMMISSION

TYPE_____ VEHICLE No._____

_____GARAGE

GARAGE DEPARTMENT GENERAL INSPECTION SHEET

DATE OF INSPECTION_____ 19

ROUTINE OF INSPECTION	WORK DONE BY		DATE	REPORTS COPIED FROM REPORT CARDS AND SIGNING IN SHEETS SHOW ROAD CALLS IN RED INK	REPAIRED BY
	1250 MILES	2500 MILES			

1250 MILES

- a. Examine radiator for leaks.
- b. Examine bonnet catches.
- c. Examine radiator tie rod and radiator bolts.
- d. Examine engine for oil leaks.
- e. Examine fan belt and grease fan pulley.
- f. Oil accelerator cross shaft.
- g. Grease clutch spindle.
- h. Grease clutch thrust race.
- i. Examine universal discs and bolts.
- j. Examine transmission for oil and leaks.
- k. Examine clutch pedal for clearance.
- l. Lubricate control shafts.
- m. Jack up rear wheels test for brake clearance.
- n. Examine rear system for lubrication.
- o. Lubricate king pins and tie rod connections.
- p. Lubricate spring leaves.
- q. Check tires.

2500 MILES

1. ENGINE

- a. Run engine and examine for knocks.
- b. Examine radiator connections.
- c. Examine engine holding down bolts.
- d. Test compression.
- e. Clean purolator.
- f. Lubricate air pump.
- g. Examine breaker points.
- h. Examine lead wires.
- i. Examine and clean spark plugs.
- j. Drain air tank.
- k. Test oil pressure.
- l. Wash engine.

2. CARBURETOR.

- a. Remove jet caps and clean wells.
- b. Tighten exhaust and intake manifolds.
- c. Examine accelerator.
- d. Examine choke.
- e. Clean air strainers.
- f. Clean out gas lines and vacuum.

3. ELECTRICAL.

- a. Clean and adjust generator.
- b. Check output.
- c. Check bearings and connections on generator.
- d. Examine battery and connections.
- e. Examine starting motor and connections.
- f. Examine all lights.
- g. Test all bells and buzzers.
- h. Test and adjust horn.
- i. Examine ignition and lighting switches.

4. CLUTCH AND TRANSMISSION.

- a. Examine clutch fingers.
- b. Examine hand brake lever and ratchet.
- c. Test gear change.
- d. Tighten transmission holding bolts.

5. PROPELLOR SHAFT

- a. Examine all universal joints.
- b. Examine flange nuts.
- c. Lubricate universals.

6. REAR SYSTEM

- a. Test for lift and end play in wheel bearings.
- b. Examine brake linings for wear.
- c. See that wheels are tight on the tapers.
- d. Examine brake drums for wear.
- e. See that flanges are tight on drive units.
- f. Tighten rear spring clips.
- g. Examine rear springs for broken leaves.
- h. Lubricate rear springs.
- i. Lubricate brake cylinders.
- j. Wash grease off brake linings and drums.

7. FRONT AXLE AND STEERING

- a. See that front spring clips are tight.
- b. Jack up front wheels and test for wear and adjustment.
- c. Grease front wheel bearings.
- d. Test for wheel alignment.
- e. Examine tie rod arms.
- f. Examine front springs for broken leaves.
- g. Examine tie rod connections.
- h. Examine drag link.
- i. Examine steering for looseness or play.
- j. Lubricate spring leaves.

8. BODY

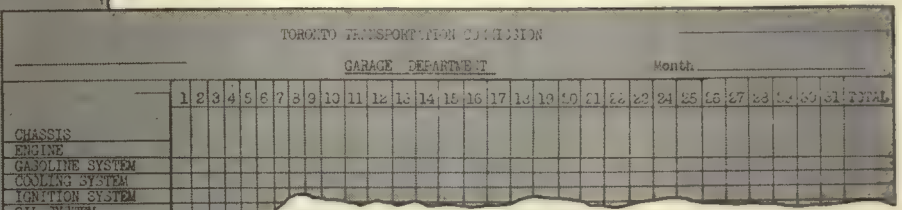
- a. See that interior of vehicle is clean.
- b. Examine for loose and worn seats.
- c. Examine for noisy windows.
- d. Examine heater pipes and coverings.
- e. Examine heater valves.
- f. Tighten all body and holding bolts.
- g. Examine fenders for rattles or damage.
- h. Examine fire extinguisher bracket.

5000 MILES

- a. Clean exhaust ports.
- b. Examine manifold gaskets.
- c. Examine exhaust and intake valves on air pump.
- d. Examine valves in brake control.
- e. Change magneto.
- f. Examine carburetor floats.
- g. Clean carbon from stew pots.
- h. See that throttle is in good order.
- i. Change generator.
- j. Focus head lights.
- k. Clean and examine destination and route signs.
- l. Drain and refill crank case.

Should any discoloration of either oil or grease be noted, Foreman's attention should be called to same immediately.

Inspection Sheet— The driver's reports of defects found in the vehicle and also road mechanic's reports are entered on this sheet daily.



TORONTO TRANSPORTATION COMMISSION

GARAGE DEPARTMENT

Month_____

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL
CHASSIS																																
ENGINE																																
GASOLINE SYSTEM																																
COOLING SYSTEM																																
IGNITION SYSTEM																																
OIL SYSTEM																																
CLUTCH																																
TRANSMISSION																																
BRAKES																																
DIFFERENTIALS																																
REAR AXLES																																
FRONT AXLES																																
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BODY																																
BUMPERS																																
FENDERS																																
DOORS AND CONTROLS																																
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WINDSHIELD WIPERS																																
LIGHTS																																
HEATERS																																
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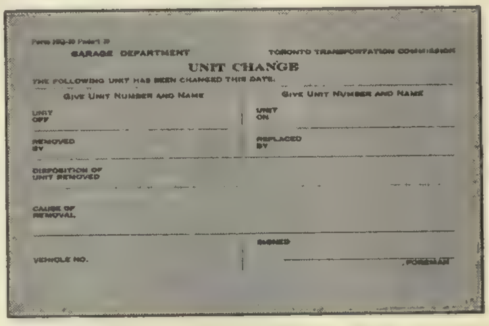
TOTAL																																

Report Form for Change-offs and Road Calls



GARAGE DEPARTMENT

TORONTO TRANSPORTATION COMMISSION

UNIT CHANGE

THE FOLLOWING UNIT HAS BEEN CHANGED THIS DATE.

Give Unit Number and Name	Give Unit Number and Name
UNIT OFF	UNIT ON
REMOVED BY	REPLACED BY

DISPOSITION OF UNIT REMOVED

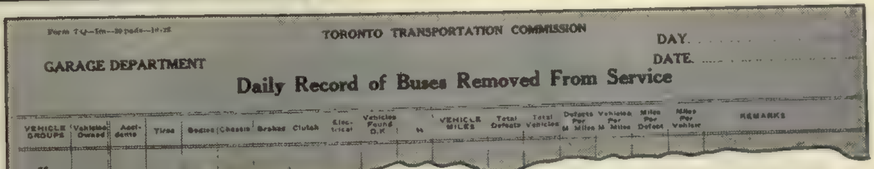
CAUSE OF REMOVAL

VEHICLE NO.

SIGNED _____ FOREMAN

Unit Change

A mechanic making a unit change fills in this slip and the change is then recorded on a card index system—each type of unit having a card of its own.



TORONTO TRANSPORTATION COMMISSION

DAY. . . . . .

GARAGE DEPARTMENT

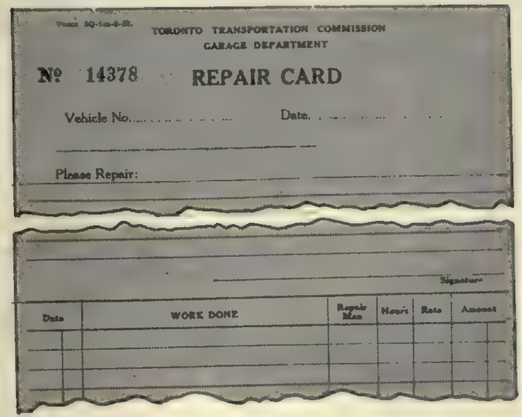
DATE. . . . . .

Daily Record of Buses Removed From Service

VEHICLE GROUPS	Vehicles Owned	Accidents	Tires	Bodies	Chassis	Brakes	Clutch	Electrical	Vehicles Found O.K.	%	VEHICLE MILES	Total Defects	Total Vehicles	Defects Per M Miles	Vehicles Per M Miles	Miles Per Defect	Miles Per Vehicle	REMARKS
Y																		
Z																		
XC																		
XB																		
YW																		
AB																		
ALB																		
ALC																		
W																		
J																		
MS																		
Total																		
CORRECT																		

Daily Record of Buses Removed From Service

This is compiled from change-off sheets and mileage books



TORONTO TRANSPORTATION COMMISSION
GARAGE DEPARTMENT

№ 14378 REPAIR CARD

Vehicle No. . . . . Date. . . . .

Please Repair:

Signature

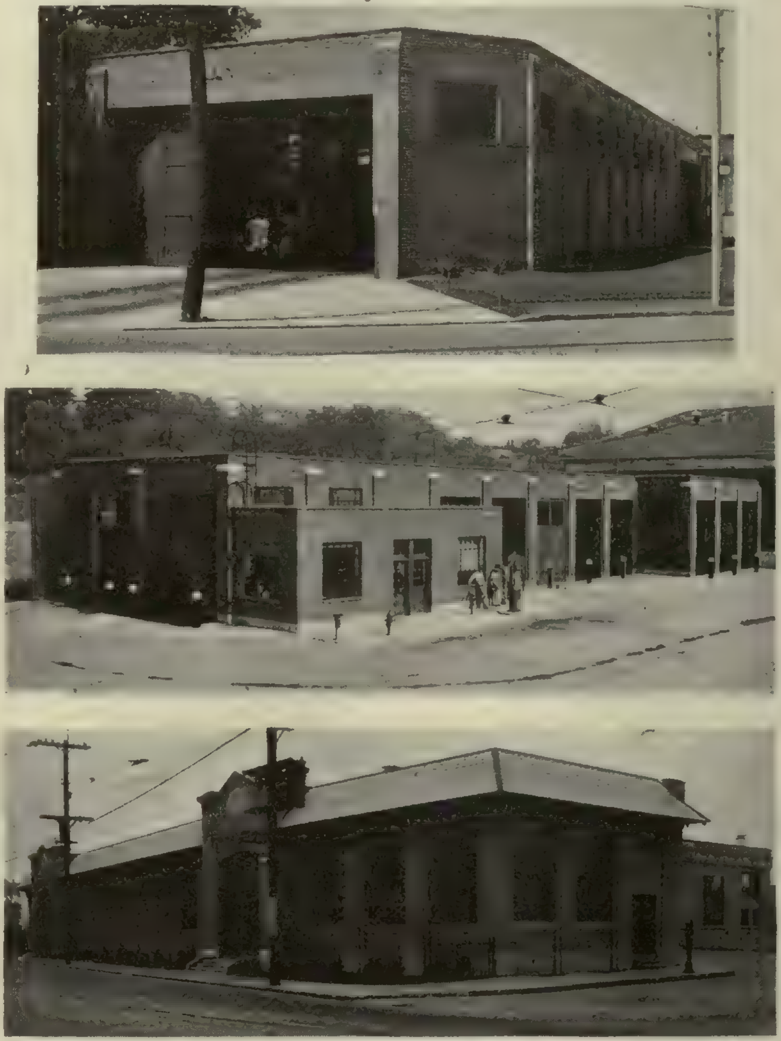
Date	WORK DONE	Repair Man	Hours	Rate	Amount

Repair Card

This form is made out for every repair made to a vehicle—the senior foreman filing in the items to be repaired and the men filling in the time and work done and material used. The record as to prices and quantity is completed in the office.

garage building. All regular maintenance work is done here in connection with the vehicles operating from this point, as well as the major repairs and overhauls for all vehicles. All tire repairs are made here.

At the Sherbourne terminal for radial express and freight service downtown, part of the old street car shops were rearranged to give garage accommodation for 57 vehicles. All interurban and sightseeing coaches operate from here, as well as several bus routes operating in the east end of the city. Garage space is rented at Hamilton, Ontario, for cleaning and running repairs only and accommodation is furnished for whatever coaches are at this terminal overnight. The motor coach department, in charge of operation, has divisional offices in Davenport and Sherbourne garages and the garage department has its office at the Davenport garage.



Architectural simplicity gives pleasing appearance to garages of the Toronto Transportation Commission

At top, Howard Avenue—the first bus garage—built in 1921.
In center, garage for service trucks adjacent to Hillcrest general shops.
At bottom, Davenport garage, showing entrance drive at the right and exit door at left.

Buses and coaches are allocated for their runs according to the schedules and requirements of the motor coach department. Assignments are posted on blackboards at the various garages. The buses are placed in readiness for the drivers with the appropriate run numbers and signs showing, and are booked out of the garage on leaving. On its return each vehicle is inspected, filled with gasoline and water, oiled and classified as for service, general inspection or repair. If it is classified for service, it is cleaned inside and out and placed in position for the next booking. Then the tires and battery are checked and minor adjustments made. A typical exit is shown in an accompanying illustration. Water is checked there. An air hose for tires is provided also. Extra seats are readily available, and the demountable side signs are racked near by, as well as the run number signs.

Greasing is done thoroughly every 1,250 miles and a general inspection is made every 2,500 miles. The vehicles are "called" the day previous to inspection. Of great value at this time is the record which has been kept of every defect of that particular vehicle since the last inspection. The work done at this time consists of thorough lubrication and a check over of all working parts and the body. The brakes are examined and tested. The engine is cleaned and tuned. Tires are carefully gone over for minor cuts and are replaced if necessary. Every effort is made here to insure uninterrupted service for the next 2,500 miles. Every 5,000 miles a more complete inspection is made.

Vehicles requiring major repairs on account of accident or breakdown, or on being due for general overhaul, are placed in special bays in readiness for the repair staff the following day. The overhaul period is about 65,000 miles, or every second year. At this time the engine and chassis are gone over thoroughly and all necessary replacements made to run a second period. However, as the equipment gets older the general overhaul process will gradually be changed to replacement of the major units at inspections.

The whole maintenance program is based on the mileage operated, which is tabulated daily for every vehicle. From this individual record the usefulness of any unit may be determined.

Garage equipment is not elaborate. Machine and blacksmith work is sent to the general shops. The four repair pits are adjacent to the toolroom and stores. Brake relining is done on a machine here and all air-brake equipment is rebuilt and tested in one department. The motor overhaul shop is alongside the tire shop. On the completion of the chassis work the vehicle is tested and then moved to the general shops for the body overhaul and painting. At this time improvements or additions are made as desired. With the finish of the painting the vehicle is then ready for the road.

The commission has found that best results are obtained when repair work on bus chassis is performed by a separate force than engaged in car repair work. Experience, however, has shown that the repair work on bus bodies can be more economically performed by the same staff which does the repair work on car bodies. This results in economy and keeps the bus maintenance staff down to a minimum.

Light Oils for CAR BEARINGS Have Possibilities

Experiments on Chicago Surface Lines and Chicago, North Shore & Milwaukee Railroad indicate that better lubrication with smaller temperature rises can be obtained by use of one grade of light oil for all season

By
E. H. HILLMAN
Technical Division, Standard Oil Company of Indiana,
Chicago, Ill.

OILS which have a light body more like kerosene than like ordinary car lubricants, are now being used by some electric railways. They possess such a high degree of adhesion to metals that even after the journal has been at rest a long time sufficient oil remains to provide adequate lubrication and prevent overheating. Such oils have been used both on high-speed interurbans and on city street cars, with marked reductions in bearing temperatures as well as savings in energy consumption. Tests made on equipment of the Chicago Surface Lines and Chicago, North Shore & Milwaukee Railroad show many advantages for low viscosity oils.

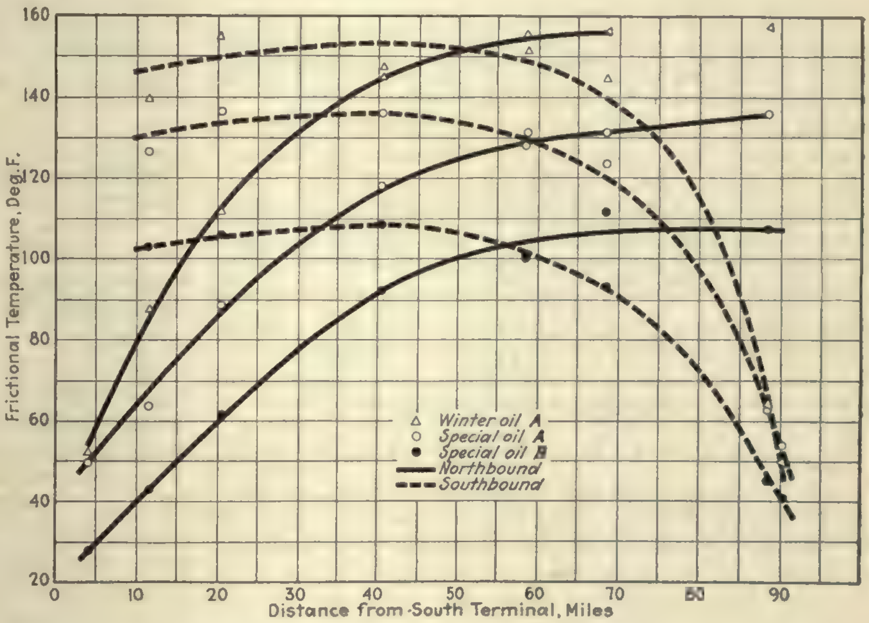


Fig. 1—Journal bearing temperature rise on high-speed interurban runs averaging 39 m.p.h. schedule speed between terminals. Five round trips were averaged for winter and special oil "A" and three for special oil "B"

Besides forming an oil layer between the brass and the journal, a good car oil must adhere strongly to the surfaces. Small amounts must remain even under the very high pressures and severe rubbing encountered when cars are accelerated or braked rapidly. This second requirement has been given the lesser consideration, but is really the more important. According to Karelitz[1] in the Westinghouse laboratories, the amount of oil supplied by capillary feed through waste is frequently negligible compared to the oil pumping capacity of the bearing. This indicates that oils which will feed rapidly and adhere tenaciously to the bearing surfaces can be used with advantage. Various car oils differ in this respect to a considerable extent.

In a typical journal box the waste must lift the oil several inches, at the same time retaining sufficient resiliency to maintain good contact with the journal in spite of a tendency to settle because of the jarring action of the truck.

Lubricants differ widely in their tendency to make a specified grade of waste become soggy and fall away from the journal. Oils differ also in their rate of feed through waste. To complicate matters further, various grades of waste possess different degrees of resiliency and capillarity—ability to maintain journal contact and draw up oil. Other things being equal, the lower the oil viscosity the faster it will feed and the more positive the resulting lubrication. The lighter oils usually have much less tendency to make the waste soggy or heavy. Soap fillers tend to reduce the rate of oil feed.

Adequate bearing lubrication requires an oil with suffi-

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[1] *Valuable discussion of journal lubrication theories will be found in the works of the following authors: A. Kingsbury, W. H. Herschel, S. A. McKee, D. P. Barnard IV., W. J. Harrison, H. A. S. Howarth, Petroff, G. B. Karelitz.*

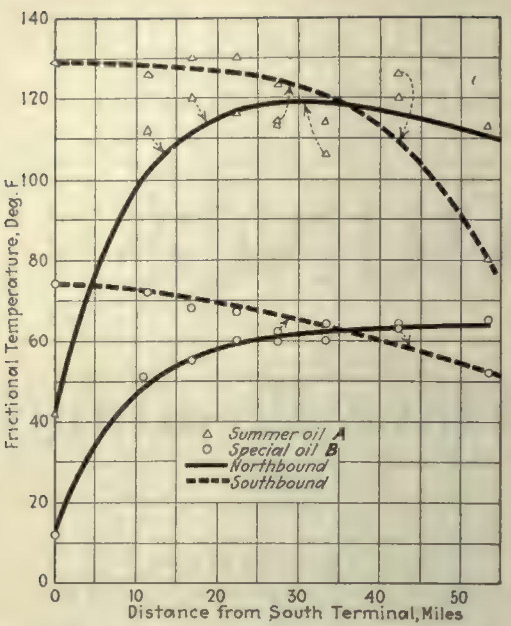

Fig. 2—Journal bearing temperature rise on moderate speed interurban runs averaging 25.6 m.p.h. schedule speed between terminals

cient body to form a fluid layer separating the journal and the bearing. This layer of oil is constantly being forced out at the edges of the bearing and as constantly being replenished by a new supply from the waste in contact with the oil. The usual practice has been to secure an oil film of the necessary thickness by making the oil so heavy that it could not readily be forced out of the bearing. Such an oil necessarily feeds more slowly through the waste, especially in cold weather. The rate of feed is reduced even more when soaps are compounded with car oils. The net result is that with a viscous oil there may be less oil on the bearing surface than with a thin oil. Heavy lubricants require more force to move the bearing surfaces over each other. This appreciable energy loss can, to a large extent, be avoided.

Light Car Oils Coming Into Use

Car oils have ordinarily been characterized by their high viscosity, running from about 200 seconds Saybolt at 100 deg. F. for a low viscosity winter oil to 1,000 seconds for a heavy summer grade. Light oils are not entirely new in railroad experience, however. Some years ago oils of about 57-66 viscosity at 100 deg. F. were in use on a French railroad.[2] More recently, Dr. W. B. D. Penniman of Baltimore[3] has done much to demonstrate the advantages of lubricants having low viscosity and high adhesiveness.

The tests described in this article were made jointly by the Standard Oil Company of Indiana, the Chicago Surface Lines and the Chicago, North Shore & Milwaukee Railroad to study further the possible merits and advantages of such low viscosity car oils. Tests were made in warm and cold weather, on both light and heavy cars under a variety of speed and service conditions. Of seven oils undergoing the test the first four were typical car oils of well-known brands, while the last three were made according to the principles previously outlined.

The boxes were packed by the regular oilers in the usual manner. No attempt was made to measure either oil or waste, but comparable conditions in lubrication were sought by having some free oil in the bottom of the boxes at all times. With heavy oils the waste holds much oil which will be forced out as it is pressed into the box. On the other hand, light oils drain very completely from the waste but feed rapidly due to their high capillarity.

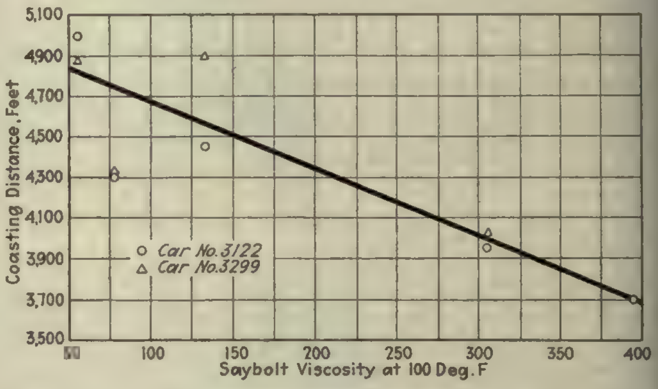

Fig. 3—Street car coasting tests conducted in La Salle Street tunnel, Chicago Surface Lines. Oil was changed in journal bearings only

During runs with the test cars bearing temperatures were taken by means of thermocouples inserted in holes drilled to the center of the brass, the end of the hole being as near the bearing surface as possible.

In regular service it was found impossible to standardize runs so that reliable data on relative energy consumption could be obtained. Therefore simulated service tests were arranged to show the differences in energy consumption between the various oils. For convenience, these are expressed in kilowatt-hours per car-mile.

These tests consisted of runs back and forth on a level track 1.781 miles long. On each run four starts at predetermined points were made, followed by running with maximum acceleration and full power for a fixed distance, then coasting to the next starting point. When bearing temperatures reached equilibrium, test runs (usually twenty) were made. Thus service operation was

TABLE I—STREET CAR RUNS—SIMULATED SERVICE CONDITIONS

Oil	Number of Tests	Number of Runs	Temperature, Deg. F. Journal	Temperature, Deg. F. Air	Temperature, Deg. F. Rise	Corrected Rise, Deg. F. Air*	Corrected Rise, Deg. F. Air and Speed†	Speeds, M.P.H. Schedule	Speeds, M.P.H. Running	Kw.-Hr. per C.M.	Relative Energy Used	Viscosity at Journal Bearing Temperature Saybolt	Viscosity at Journal Bearing Temperature Absolute
Special oil "B"	9	170	100.5	51.0	49.5	37.5	37	13.49	20.53	1.670	0.973	77	0.132
Winter oil "B"	7	130	129.0	57.5	71.5	59.0	60	13.49	19.80	1.716	1.00	148	0.282
Special oil "B"	5	100	111.5	67.5	44.0	39.5	37	13.49	21.33	1.662	0.968	68	0.104
Summer oil "B"	2	40	145.0	69.5	75.5	68.0	72	13.50	19.28	1.754	1.022	137	0.248
Special oil "A"	8	160	121.0	76.5	44.0	42.0	39	13.48	21.51	1.674	0.976	89	0.155
Special oil "C"	4	80	116.0	84.0	31.5	36.0	34	13.49	21.73	1.638	0.954	38	0.063

* Temperature rise (frictional temperature) corrected to an air temperature of 80 deg. F. was taken as standard since the data were not sufficient to estimate the rise for special oil "C" at lower temperature.

† Temperature rise corrected to an air temperature of 80 deg. F and a speed of 20 m.p.h.

These groups of runs are listed in the order in which the work was done. Each test represents a group made on the same day. Oils were changed in all bearings.

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[2] *Proceedings International R.R. Assn., Vol. 7, No. 4, April, 1925.*

[3] Electric Railway Journal, *October 13, 1928.*

simulated closely but the running speed of about 20 m.p.h. was higher than that ordinarily maintained. The same motorman operated the test car throughout.

In every instance journal bearing temperatures represent the average for the eight journals. In the street car tests armature and axle bearing temperatures were also taken. They show the same general trend but the temperature rises are lower and the average figures more erratic. Results of these tests are summarized in Table I.

Results of tests on regular suburban runs on different roads, at high and low schedule speeds, are shown in accompanying charts 1 and 2. The temperature rises are shown, as this eliminates variations due to differences in air temperature. Frictional heat represents lost energy; excessive heat represents inefficient lubrication and frequently excessive wear. These runs show the improved lubrication obtained with special oil "B." That energy which can be saved by improved oiling is limited, of course, as bearing friction is only one of the various energy losses which occur in moving a car.

Table II gives results of higher speed runs with the same street car used in the simulated service tests. The car made ten runs back and forth on a track 3.653 miles long, averaging 27.33 m.p.h. running and 23.49 m.p.h. schedule speed, after all bearings had reached an equilibrium temperature. As could have been predicted from the relation that fluid friction losses vary as the square of the speed, the actual savings with light oils are greater than in the low-speed runs. The proportional savings are also greater because relatively less energy is used in accelerating.

It was found that considerable variations in speed and energy consumption were caused by track and weather conditions, changes in line voltage, and sometimes by traffic interruptions. It was not possible to standardize these runs as carefully as those shown in Table I. This undoubtedly accounts for the advantage observed with special oil "A" as compared with "B" and for the difference between Winter "B" and Special "A," which is larger than would have been expected from their viscosities. The general trend is the same as in the other tests.

Street Car Coasting Tests

Relative friction with the various oils was further shown by coasting tests on a track between two grades, forming a valley with approximately equal slopes (La Salle Street tunnel, Chicago Surface Lines). The set cars were allowed to coast with trolley pole down and brakes released from slope to slope until they came to rest. The motion thus consisted of a series of oscillations. Before each test the car was run in service for a day or so to make sure that equilibrium conditions were obtained and was then taken directly from service to the test so that the bearings could not cool. The sum of these oscillations, averaging at least five tests for each oil, is shown graphically in Fig. 3. The accuracy is shown by the close agreement obtained with different cars at different times.

Tables I and II show the corrected temperature rise. Where other factors are kept uniform the temperature of the bearing does not remain at a constant difference above air temperature, the difference between air and bearing temperatures tending to decrease as the air temperature goes up.

The bearing temperature rises until the oil thins down to a point where the rate of heat generation is equal to the rate of dissipation. The rate of dissipation is dependent on the difference between air and bearing temperatures, but the rate of generation is dependent principally on oil viscosity at the operating temperatures. The higher the air temperature the lower the viscosity and the less the temperature rise. When air temperature is plotted against average journal bearing temperature for each oil, a family of curves is obtained which are almost straight lines at ordinary temperatures and are roughly parallel.

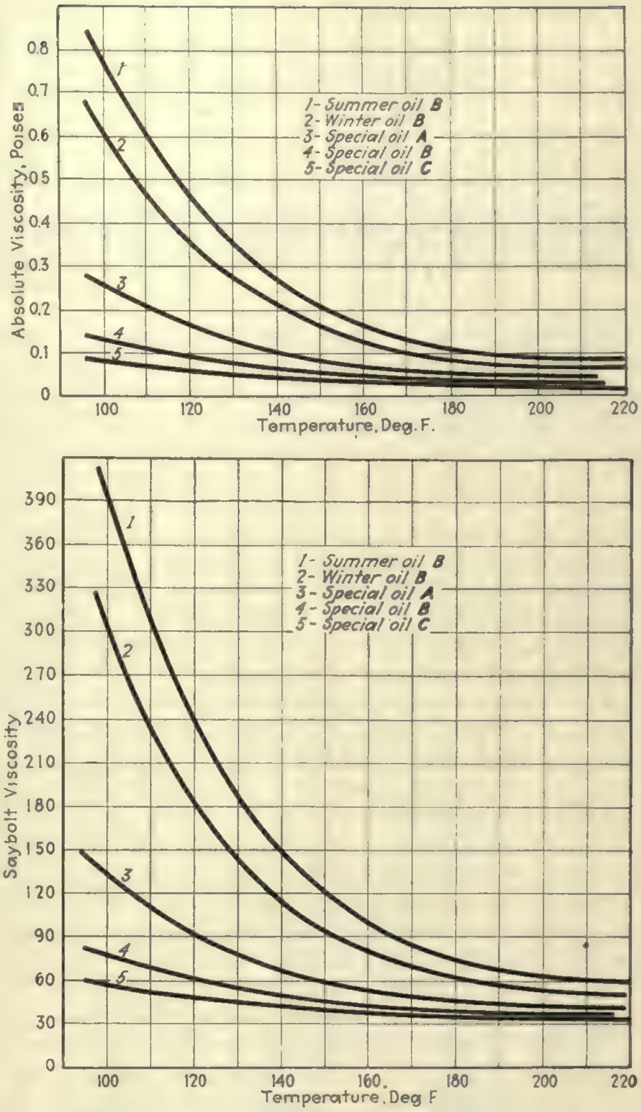


Fig. 4—Viscosity-temperature chart of oils used in street car tests. Absolute viscosities were used in all calculations since they are proportional to power loss in the oils. Special oils "B" and "C" possess a much more uniform viscosity at all temperatures

Such curves were drawn for each oil in the test and each point was moved parallel to it to a position opposite an arbitrarily selected standard air temperature from which the corresponding temperature rise was found. The resulting figures are only approximate since often there were not enough data to locate the curves accurately, but they more nearly represent true comparisons than do the uncorrected temperature readings.

In all the tests no special precautions were taken in the preparation or packing of bearings. The street car bearings were not machined or scraped. The interurban bearings were machined to $\frac{1}{32}$ in. oversize diameter.

The conclusion that no change in shop practice is necessary with the new oils was confirmed by large scale tests

TABLE II—STREET CAR RUNS—HIGH SPEED. OIL CHANGED IN JOURNAL BEARINGS ONLY

Oil	Number of Tests	Number of Runs	Temperature, Deg. F. Journal	Temperature, Deg. F. Air	Temperature, Deg. F. Rise	Corrected Rise, Deg. F.*	Speed, M.P.H. Schedule	Speed, M.P.H. Running	Kw.-Hr. per C.M. (27.33 M.P.H.)	Relative Energy Used†	Viscosity at Journ Bearing Temperatur Saybolt	Viscosity at Journ Bearing Temperatur Absolut
Winter oil "B"..........	3	30	173.0	28.0	145	91.0	23.52	27.33	2.113	....	67	0.105
Special oil "A"..........	5	50	151.0	17.0	134.5	70.5	22.96	26.94	1.875	0.91	57	0.090
Special oil "B"..........	6	60	127.5	33.5	94.0	45.5	23.79	27.79	1.899	0.92	57	0.078
Winter oil "B"..........	4	40	158.0	25.5	132.5	75.0	23.88	27.22	2.052	....	[illegible]	0.140

*Temperature rise corrected to an air temperature of 80 deg. F. and a running speed of 27.33 m.p.h.

† Based on average of two groups of runs with Winter "B" as 100 per cent.

Each test represents a group of ten runs made on the same day, in each instance bringing the bearing temperatures to equilibrium with air temperature before taking these data. The oils were changed in the eight journal bearings only. Since slower runs frequently were alternated with faster runs, ther was no time for bearing temperatures to adjust themselves; hence temperatures shown here are average without correction for running speed.

on hundreds of street cars with special oil "B" and other oils of similar viscosity. The cars were lubricated with these oils without special instructions. No overheating was found except where a few cars with new bearings were sent on long trips without stops at the beginning of their runs. Even then hot boxes did not develop.

Axle and motor bearings carry lighter loads than car journals and hence are easier to lubricate. The street car tests confirmed this, showing lower temperatures on these bearings.

There was no trouble with the oils working out of motor bearings and into the windings. This will not occur in modern rolling stock equipped with overflow pockets, but it may cause some trouble on old equipment. No exact data were secured on oil consumption, but on all types of bearings observed it was only a little more with the lightest than with the most viscous oil.

The journal bearings on the street car were 4¼x8 in., giving a projected area of 34 sq.in. Since there were eight journals the total projected area was 272 sq.in. The car weighed 47,000 lb. The weight on the bearings was this, less the weight of the axles, wheels and half the motors, or 38,600 lb., making a bearing pressure of 142 lb. per square inch on the projected area.

The revolutionary nature of these experiments will be appreciated when it is remembered that such bearings have been lubricated at low speed, using waste, with an oil of 56 seconds Saybolt viscosity at 100 deg F. Others have lubricated similar bearings with an oil of 35 viscosity at 100 deg. F.

Summer and Winter Oils Not Needed

Heretofore car oils have been made in two grades—summer and winter. For instance, where the average summer and winter air temperatures are 80 and 25 deg. F., typical oils having viscosities of 100 and 46 at 210 deg. F. will both have a viscosity of 3,500 at the summer and winter temperatures respectively. This method of oil selection is faulty, as in summer or winter after a few minutes due to frictional heat the temperature rises above summer temperatures. As the frictional heat is less in summer than in winter, and as it was found that oils much lighter than those customary for winter lubrication could be used in hot weather, the theoretical advantage of two oils was largely removed.

Car oils are seldom changed in accordance with the seasons. Where boxes are repacked at intervals of three months or more, it is obvious that frequently summer oi will remain in use during the coldest weather, while the winter oil must lubricate on many a hot day. On steam roads, where boxes are repacked twice a year at most the use of two oils has even less justification.

TABLE III—OILS USED IN TESTS

Oil	Viscosity at 100 Deg. F.	Calculated Viscosity at 0 Deg. F.
Summer "A"................	629	150,000
Summer "B"................	396	30,000
Winter "A"................	272	15,000
Winter "B"................	305	32,000
Special "A"................	133	8,000
Special "B"................	78	1,550
Special "C"................	56	650

Oils such as special oil "B" or "C" can be used in hot weather and at the same time are more fluid at low temperatures than the old winter car oils.

Several distinct advantages result from the use of light car oils. These include (a) saving in energy consumption, (b) lower bearing temperatures resulting in fewer hot boxes, (c) less bearing wear, (d) longer life of waste, (e) same oil summer and winter, and (f) fewer pull-ins.

The results obtained on typical properties under (a) and (b) above have already been shown. Less bearing wear has not been proved experimentally but must follow from the power and temperature effects.

Waste will last longer with these oils on account of the entire absence of heavy ingredients which clog the waste, making it soggy. The dirty waste can be reclaimed with surprising ease and with a minimum loss. On some roads waste consumption was reduced greatly, while the time between reclaiming was much longer than with ordinary oils.

By reducing bearing friction greatly the use of an oil such as special "B" will reduce the need for roller bearings. Mechanical lubricators designed to replace waste will be of less advantage due to the increased life of the waste.

Car Oil Specifications

Future experience will show just how low in viscosity modern car oils can be made. Oils lighter than special "B" were not tried in the interurban tests, nor have they been given extensive street car service tests. For the present the following safe limits can be set for electric railway car journal oils:

Viscosity at 100 deg. F.—75 to 80.
Viscosity at 0 deg. F.—As low as possible consistent with the above.
Pour test—10 deg. below 0 deg. F.

The viscosity at 0 deg. F. is an important property which heretofore has been given little consideration. High fluidity at low temperatures is just as important as proper viscosity at ordinary temperatures. If the oil becomes too viscous when the car is at rest in the winter, proper feed through the waste may be interrupted and bearing friction increased. The maximum demand load will be decreased materially by the use of oils having low viscosity at low temperatures. This property of low viscosity at low temperatures has no relation to pour or solid point. The pour should be as low as the lowest probable winter temperature. Even a very light oil may have a high pour point due to the formation of wax crystals. The wax before solidifying is a very thin liquid.

Attention to Fundamentals Reduces Overhead Maintenance

By
L. W. BIRCH
Assistant Manager Railway Division
Ohio Brass Company

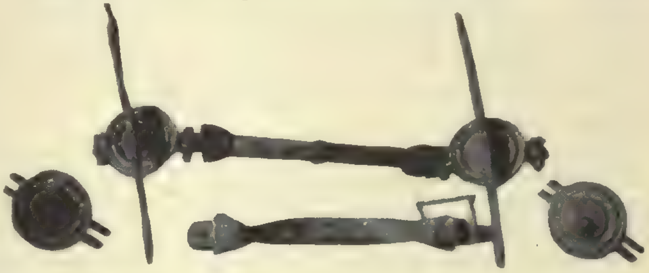
Use of high-grade materials and proper construction methods results in longer life and less need for repairs. Insulation is of the utmost importance

❧

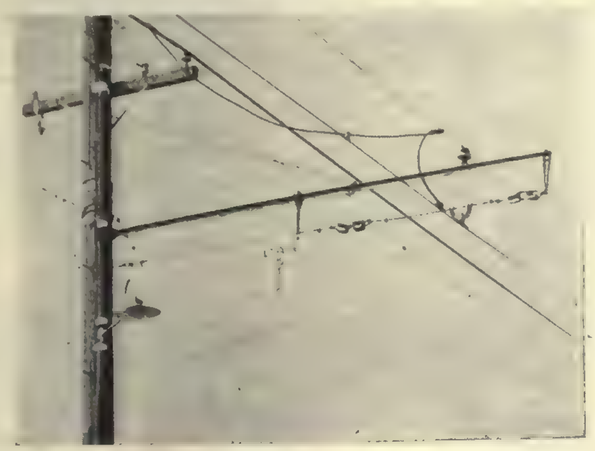
REDUCTION in maintenance costs usually is based on one fundamental principle. This is, "Build to stand." This principle obtains particularly in over-ad work. The class A pole outlasts the second grade, te galvanized steel fitting resists corrosion better than te painted one, and double insulation in a span wire events an attempt to heat all outdoors through current kage. Following this principle is far better than imping and deferring needed repairs. The following scussion considers some of the recognized good practes, and some which are worthy of greater use than is und today. Every one of them is based on the prinple of building to stand.

In some of the larger cities, particularly where the nosphere is smoke laden, ere is corrosion of the span ires. The same is true along t sea coast where salt fogs evail. Corrosion of steel an wires, even though galnized, may take place ickly in the presence of t or smoke. It is produced a number of conditions.

To begin with, the lineman, in serving a span wire at an insulator or fitting, strips a certain portion of the zinc coating off the wire by permitting the strands to slide between the cutting edges of his pliers. While this is a recognized method, it exposes the steel strand to the atmosphere, and rusting or corrosion immediately starts. When the span wire is attached to an insulator, particularly a span insulator, that is coated or dirty, leakage of current is likely to take place. This in turn sets up a plating action which not only tends to destroy the strand but also deposits a metallic conducting layer on the surface of the insulator. This plating action only takes place in the presence of some electrolyte, such as salt or a weak solution of sulphuric acid which is formed through the presence of sulphur in a smoke-laden atmosphere. Again, if the strand and the part to which it is connected are made of dissimilar metals the well-known battery or cell action is set up where an acid solution is present. Current leakage if of sufficient severity will burn the strand. This, of course, is not helped out materially by the choice of strand except in so far as a metallic deposit



An example of burning due to leakage of current in a salt fog vicinity. Flat spans did not permit the drip water to avoid the insulator. Greater slope to the span wire and drip points in the fittings would have decreased this trouble



Double insulation is good practice, especially in a coast district. Note that the porcelain strain insulators are connected in series on each side of the contact wire under the mast arm. Connections are made with clips which serve as drip points

Lkage currents over the surface f insulators cause a plating acion that deposits metal on the ace of the porcelain, rendering t useless as a non-conductor

A contact wire does not have long life when only a few pull-overs are placed to support a curve. Excessive wear develops at the ear joints

on a span insulator might be averted, providing the plating action referred to has been stopped through the proper choice of materials.

To obviate such troubles as this, spans of non-ferrous material have been installed on a number of the larger properties. The practice was started along the seacoast where salt fogs prevail, but later several of the larger operators in the interior of the country began the use of non-ferrous span wires to reduce maintenance cost by safeguarding against corrosion. As an example of the difference, in Havana it formerly was necessary to replace ½-in. steel span wires at twelve-month intervals as they disintegrated through salt water corrosion. Now with non-ferrous wire a number of spans have been in use four years and the life of the span has not yet been determined.

Copper feed-in spans have been in use for many years. The life of these spans is usually much greater than that of a steel span in the same district, providing the copper span is not overworked mechanically. Of course, the non-ferrous span is more expensive in first cost, but if it lasts twice as long as a steel span it is a good investment when the cost of labor for replacing is included. It is not the purpose of the writer to advocate non-ferrous span wire universally instead of steel span wire. But there are many locations where the steel span wire has short life and must be constantly replaced. These locations warrant study and usually maintenance costs are decreased through the use of non-ferrous materials.

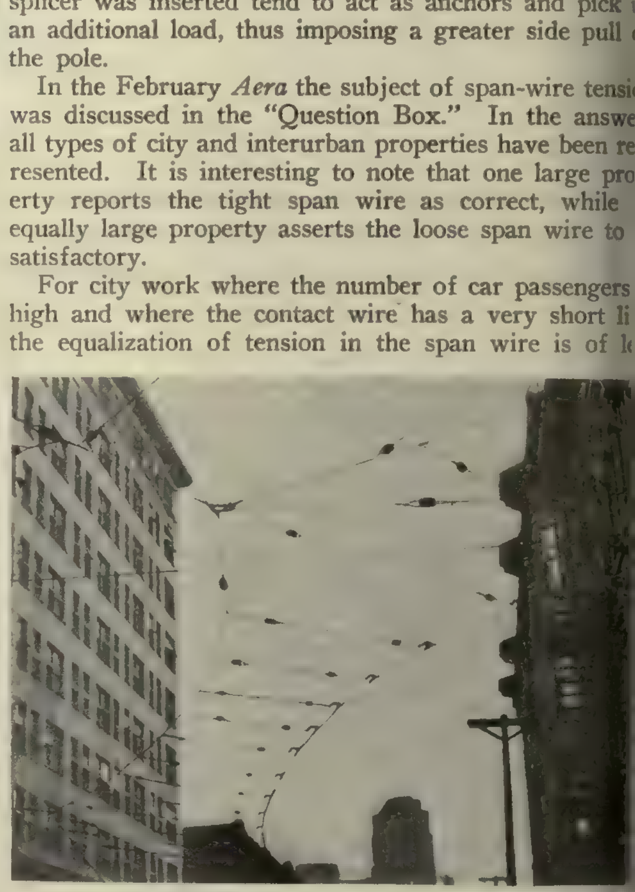
The use of non-ferrous strand must necessarily call for some study of fittings. A combination of bronze or copper strand with iron fittings tends to produce cell or battery action through the presence of the dissimilar metals. With a bronze or copper span wire, bronze fittings must necessarily be used in order to get full life out of the strand.

Span-Wire Tensions Vary Over a Wide Range

While there is no standard definition of tightness or looseness of a trolley wire span wire, a tight span wire is usually considered as one which is pulled up to the point where it is being worked close to its elastic limit at minimum temperatures. It is then working at its maximum allowable load under the most severe conditions. The loose span wire is permitted to sag deeply and is working at a reduced load with consequent reducti in side pull to the supporting pole. The tight span wi has an advantage for city work in that a shorter pole c be used. However, the side pull is of sufficient magnitu to require a fairly husky pole. While there is very lit difference in the cushioning effect, the loose span wi will permit equalization of tension in successive spa For instance, the "cutting-in" of a splicer may elimina a few inches of trolley wire. This necessarily increas the tension which exists in this span but it can equalized throughout a number of adjacent spans fairly slack span wires are used. With very tight sp wire, the span wires adjacent to the point where t splicer was inserted tend to act as anchors and pick an additional load, thus imposing a greater side pull the pole.

In the February *Aera* the subject of span-wire tensi was discussed in the "Question Box." In the answe all types of city and interurban properties have been re resented. It is interesting to note that one large pro erty reports the tight span wire as correct, while equally large property asserts the loose span wire to satisfactory.

For city work where the number of car passengers high and where the contact wire has a very short li the equalization of tension in the span wire is of l importance. The length of contact wire between tu outs and street intersections is comparatively short, c sequently excessive trolley wire sags do not exist. systems where the contact wire lasts for many years question of slack in the contact wire is always a probl Slack may be taken out of the wire at the splicer poi and at special work. However, it often is necessary cut the wire, pull out slack and insert a new splicer. it is necessary to eliminate 1 ft. to 2 ft. of trolley w to secure the proper sag and tension the tight span w is a hindrance. The slack span wire will permit of sc pulling without too great a loss of alignment at the In brief, the ear need not be stripped from the wire w this pull is made.



This curve is supported with the proper number of insulat
Note the double insulation in the pull-over wires

There seems to be no difference in the pounding ears under a tight or a loose span wire, provided trolley wire is maintained at the proper tension.

Curves with too few pull-overs invite trolley wire w at the pull-overs due to the change in direction of wheel at these points. At the other extreme, if too m pull-overs are installed on the contact wire a more rigid system is secured and the side pull is not sufficient to prevent the weight of the pull-over fitting from tilting the ear and causing side-swipe.

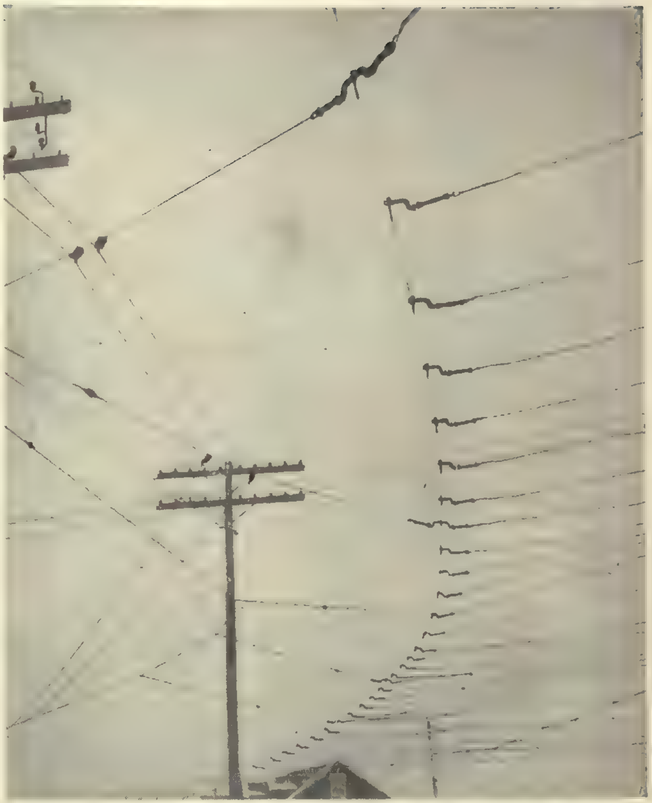
The engineering manual of the American Electric Railway Engineering Association gives the following pull-over spacing for various curves:

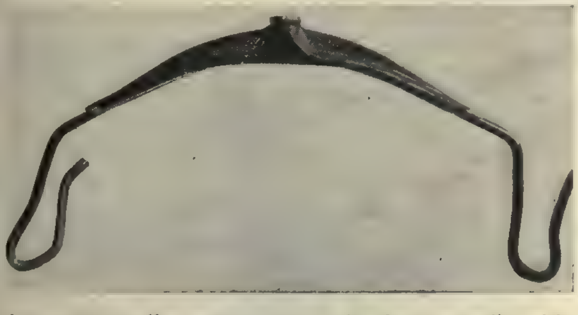
Radius of Curve, Feet	Spacing of Pull-overs, Feet
40	7
50	8
60	9
70	10
80	11
90	12
100	13

This spacing is sufficient to maintain uniform curvature of contact wire and at the same time permit single curve pull-over fittings to hold their alignment and not permit the trolley wheel to strike the side of the trolley ear. The A.E.R.E.A. tabulation has worked out satisfactorily both from the standpoint of maintenance and from the standpoint of the theoretical number of pull-overs which should be used. Accompanying illustrations show the results of too few pull-overs as well as too many.

SECONDARY SPAN INSULATION SHOULD BE NEAR POLES

Three types of span insulation are recognized as good practice: The wood stick insulator, the composition insulator, and the porcelain insulator. The present-day tendency is to use as much porcelain insulation in the overhead system as is consistent. Ordinarily, a porcelain strain insulator is inserted as a secondary insulation where an insulated hanger is used for supporting the trolley ear. Often the secondary insulation is placed within a few feet of the pole, while sometimes the insulation is carried farther into the span. As mentioned previously, corrosion of the span wire may occur through the leakage or plating action at the strain insulator. This leakage is greatest during rain, or when there is the most fluid or electrolyte on the insulator. Naturally the straight current leakage due to smoke or dirt deposit is greatest in the presence of water. Its slope forces the drops of water to run down the span wire to the first insulator or attachment in it. The water usually drops off where the attachment or the insulator forms drip points. These drops of water carry particles of dirt which further tend to increase leakage during a rain, although a dashing rain sometimes cleans the span wire and insulators, thus diminishing the leakage. For the above reason the secondary insulation in the span wire should be placed as near the supporting pole as the law will permit and should be so attached in the span that water drips from the span or attachment rather than from the insulator. Most span insulator attachments are shaped to permit this drip on the attachment rather than on the insulator.

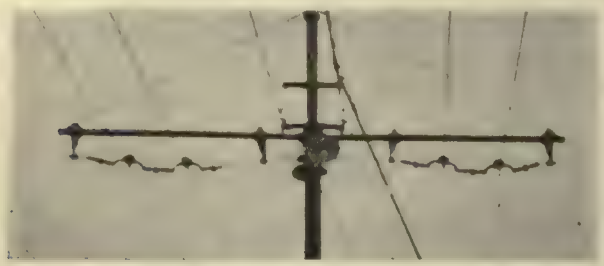

Too many pull-overs form a rigid overhead system. Usually it is impossible to maintain sufficient tension in the pull-over wires to prevent tilting of the fittings and side-swiping of the ears


A new 00 trolley ear, 12 to 15 in. long, usually withstands 1,000 lb. dead load as this one did. Note the central holding section continues to surround the wire, while the approach ends are slightly loose

There is a greater drip at the insulation nearest the contact wire whether it be a separate insulator or an insulated hanger. Usually the length of clear wire between contact wire and secondary insulation is greater than the length between secondary insulation and pole. Thus there is more opportunity for the collection of water and dirt and the insulation at or near the contact wire must stand more than the secondary insulation.

LONG TROLLEY EARS ARE USED MOST

Proper length of trolley ears has been the subject of many discussions. There is no "best" length, inasmuch as various ears have their particular operating advantages. In the first place an ear must withstand the dead weight of the trolley wire and other fittings suspended from it, which in the 100-ft. span rarely exceeds 100 lb. A very short length of ear will hold a 100-lb. weight providing there is nothing to burn the ear or reduce the section through wear. The average clinch ear has sufficient length and section to support approximately 1,000 lb. This requires a middle section in the ear of approximately 6 in. Depending on the thickness of the lips, the approach section which is added to the holding section varies in length from 3 in. to 4½ in., making a total length of from 12 in. to 15 in., depending on the degree of grinding or sloping on the approach ends. The approach of an ear does not clamp the contact wire as tightly as does the center holding section, partly because the approach must permit the wheel to ride over the ear with as little bump as possible. However, the approach ends of an ear must also partially damp the wave produced in the trolley wire by the trolley pole and wheel. The gradual damping of this wave at the ear decreases the fatigue in the wire and prolongs its life. With the longer ear the trolley wheel approach is gradual and the shock of the wheel falls directly against the ear rather than beyond as it does with the short ear.



The secondary insulation between the positive and negative wires is so low it forms a drip point. The collection of sediment and eventual leakage of current and burning may be expected on the surface of the insulators

For the average 100-ft. span the 12-in. to 15-in. ear is giving the best results. With short pole spacing it is possible to use the short ear successfully inasmuch as the loads are lighter and the trolley wire sag in the short span is not sufficient to injure the wire at the ear point. An example is in catenary construction, where short clips or ears are used at frequent intervals. However, a recent survey of the power distribution committee of the Central Electric Railway Association found that approximately 95 per cent of the ears being used at the present time are 12 in. to 15 in. long.

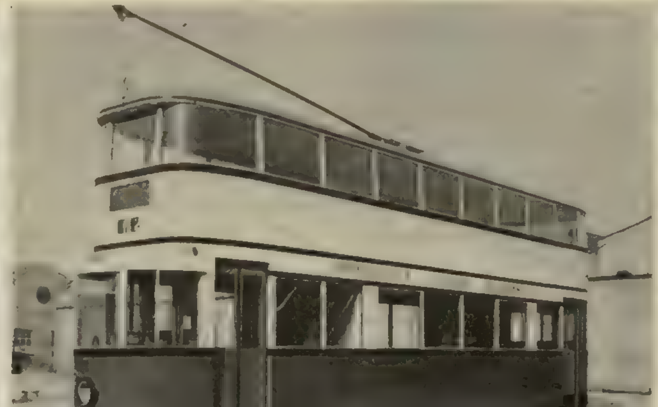
A survey of the complaints on radio interference in the states of Ohio, Kentucky and West Virginia in 1927 indicated that 5,900 complaints were received by 39 companies. Of the 5,900 complaints 14.4 per cent were due to street railway troubles. The sources of interference from street railways were classified as: (a) Poor rail bonding; (b) commutation of station converters and motor-generator sets; (c) commutation of car motors, and (d) trolley arcs.

Special Cases of Trolley Arcing

A few trolley arcs exist only when a car with the controller on passes a section insulator or an insulated cross-over. These points are carefully watched by the operating company. However, they fall in this classification and react directly on the maintenance of insulated parts and on the cost of radio interference. Besides arcs at section insulators and other insulated points frequent leaks have been found where the feed-in wire was loose in the feed tap, or where the solder had melted out due to a grounded trolley or overloading. Leakage of hangers or insulators will also produce annoyances which are classed as radio interferences. Fortunately the latter are few and only occur in extreme cases of poor maintenance or accidental line trouble.

Another source of radio trouble is the trolley frog. Many of the older trolley frogs with the open pan permit the trolley wheel to jump as the wheel passes over the pan. An arc occurs and is readily picked up on the radio, even at some distance away. The newer types of frogs, such as those which permit the wheel to operate on the runner rather than the pan eliminate much of this jumping and reduce the arcing to a minimum.

New Type Car for Metropolitan Electric Tramways



As a result of experience with two experimental cars, a new vehicle has been designed for the tramways of the London Underground group. Separate entrance and exit are provided. Cross seats have been installed, upholstered in moquette. The cab has a comfortable seat for the motorman. At his side are switches to control the lights. The car has four 35-hp. motors and eight-wheel electric brakes.

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL—65

Overcoming Controller Finger Trouble*

By H. J. Beadle

Dallas Railway & Terminal Company, Dallas, Tex.

FOR some time past trouble has been experienced on cars of the Dallas Railway due to sagging of the ground fingers on controllers. In many conditions they do not make contact with the ground conductor mounted on the insulation disk. With the original method for supporting the ground finger, shown in Fig. 1, the finger is rather flexible, so that a small bump causes it to sag below the disk, which carries the contact to the ground on the controller shaft.

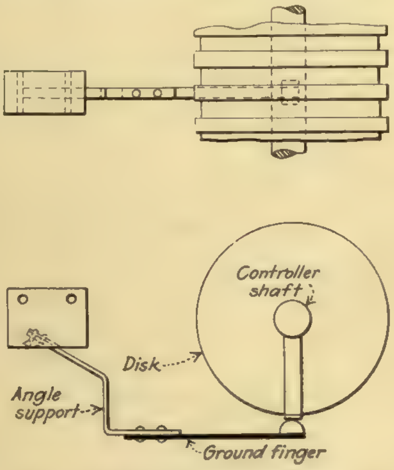


Fig. 1—Old type of construction for supporting ground finger

In Fig. 2 a new method of supporting the ground finger is shown. In this a wooden block is attached to the back of the controller frame and the ground finger is screwed directly to the block. A solid support is thus made for the finger. The position of the conductor to the ground was changed as shown. With this construction we have been able to eliminate the extra angle piece which gave the trouble, and as a result we have avoided many pull-ins. This change has been made on 176 controllers and the ground fingers are kept in alignment with the disks without trouble.

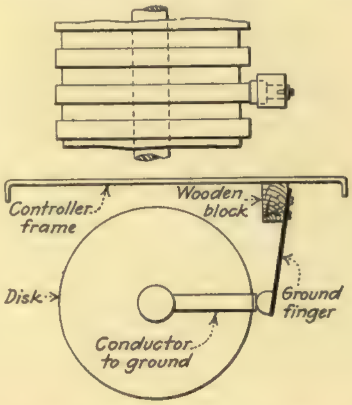


Fig. 2—New type of construction now used for ground fingers

**Submitted in* Electric Railway Journal *Prize Contest.*

Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—44

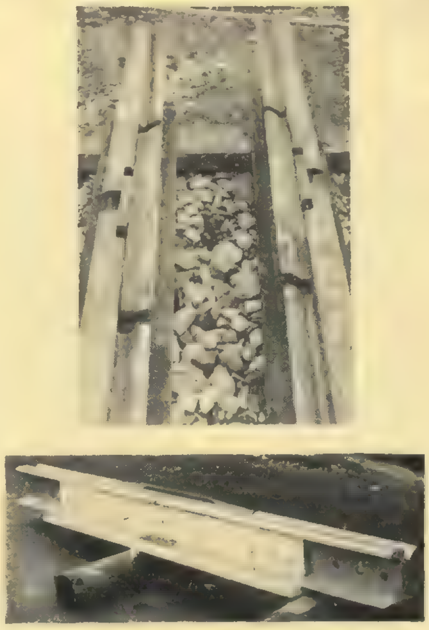
Expansion Joint for Girder Grooved Rail*

By C. R. Kinnear

Assistant Engineer of Way
Toronto Transportation Commission,
Toronto, Canada

FOLLOWING the adoption of the A.E.R.E.A. standard 7-in. 122-lb. girder grooved rail in 1921 by the Toronto Transportation Commission, it became necessary to procure an expansion joint primarily for use on bridges. Accordingly, a type of joint was designed and built by the way department, wherein the central or stationary portion is cut from a filled groove girder guard section rail with the guard left high at the center. The two end or traveling parts are of girder grooved rail and slide on the baseplate.

Wheels of cars are carried over the variable gap in the tread by the flange bearing section of the center piece, which has flange bearing risers at each end to lift the wheel to the minimum groove depth of $\frac{9}{16}$ in. The maximum expansion provided for use on lines of the Toronto Transportation Commission is 3 in.



Type of construction used for expansion joint of girder grooved rail

**Submitted in* Electric Railway Journal *Prize Contest.*

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—ELECTRICAL—66

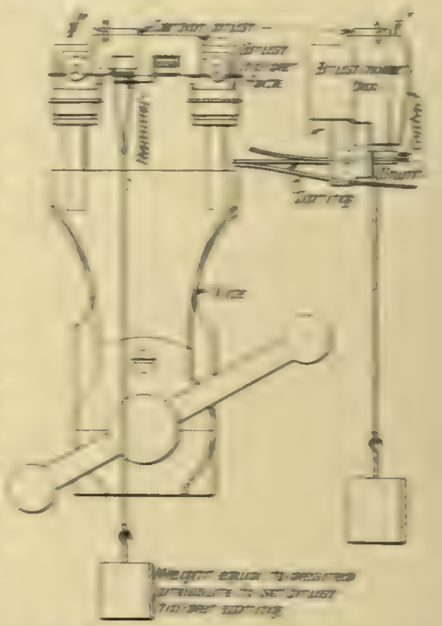
Method of Adjusting Brush Pressure*

By Arthur E. Clegg
Foreman Electrical Department
San Diego Electric Railway,
San Diego, Cal.

WHEN brush-holders are repaired it is the practice of the San Diego Electric Railway to adjust the pressure accurately. After defective parts have been replaced the brush-holder is clamped in a vise, with the hammers at the bottom as shown in the accompanying sketch. A carbon brush with a groove across the top is placed in the brush-holder box and a cord is placed around the hammer at the center of the carbon way. A weight is attached to the other end of the cord. This weight is just sufficient to give the proper amount of pressure.

If the weight does not balance the pressure of the hammer the ratchet is adjusted so as to change the brush pressure. Correct adjustment is obtained with the brush projecting ¼-in. outside the face of the brush-holder.

Proper brush pressure for the different types of motors has been determined and weights are made to be used in adjusting each type of brush-holder. These weights are stamped with the type of motor with which they are to be used. This method of measuring brush pressure provides a quick and accurate means of adjustment.



Method of adjusting brush pressure used by the San Diego Electric Railway

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*Submitted in Electric Railway Journal Prize Contest.

Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—65

Bumping Rail for Installing Special Track Work*

By E. B. Spencer
Way Department, Cleveland Railway,
Cleveland, Ohio

WHEN installing special trackwork a bumping rail is considered by the foremen of the Cleveland Railway to be an essential tool. A special rail is now used for this purpose; previously, a short length of standard rail was used. This was held by tongs and, in the course of the work, the tongs often slipped off, which was unsatisfactory. Moreover, it was usually hard to find a rail that would answer the purpose satisfactorily. With the use of the special bumping rail accidents and lost time have been cut down considerably.

The special bumping rail is 8 ft. long and weighs 500 lb. It is equipped with four sets of handles, placed 2 ft. apart. A pair of splices is riveted on each end of the rail to give more weight and to provide a broader surface. These bumping rails have fulfilled all expectations. The cost of changing from the old method to the new is only the cost of installation.

Bumping rail in position for use

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*Submitted in Electric Railway Journal Prize Contest.

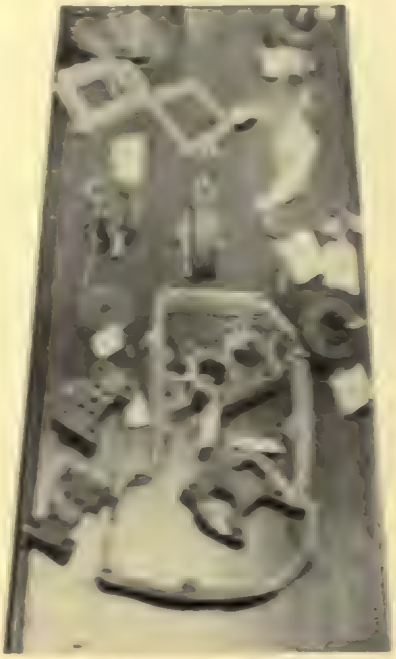
Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—55

Method for Storing Air-Brake Gaskets

IMPROPER storage of air-brake gaskets in the store room of the Richmond Railways, Inc., Staten Island, N. Y., was the cause of a great deal of destruction until a method was devised as shown in the accompanying illustration. Previously, the gaskets were stored in bins and when a certain style gasket was required it was found necessary to remove practically all of them before the one desired could be found. This often resulted in destruction of some of them. At present they are stored on a common panel and the type is visible and marked plainly. Any gasket can now be picked up readily without disturbing the remaining ones.

This arrangement improves the store room appearance, prevents unnecessary destruction and decreases the time required for the filling of orders.



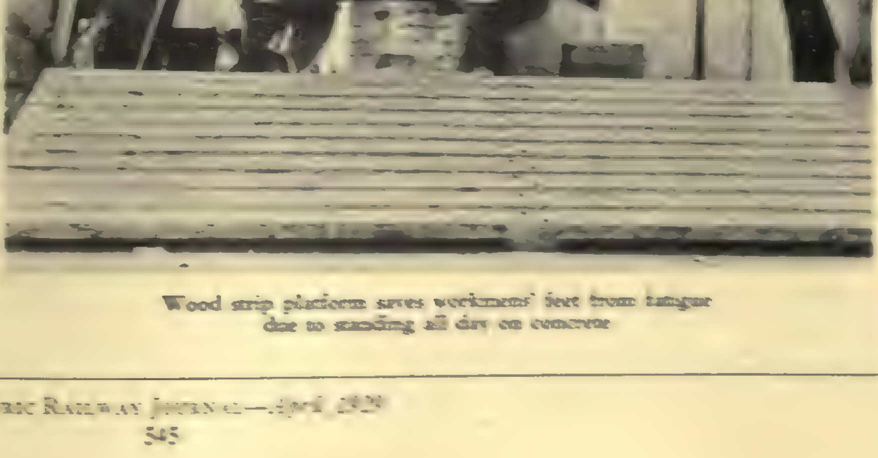
Board for storage of gaskets

Electric Railway Journal Maintenance Data Sheet

BUSES AND TRUCKS—24

Strip Platforms Improve Production

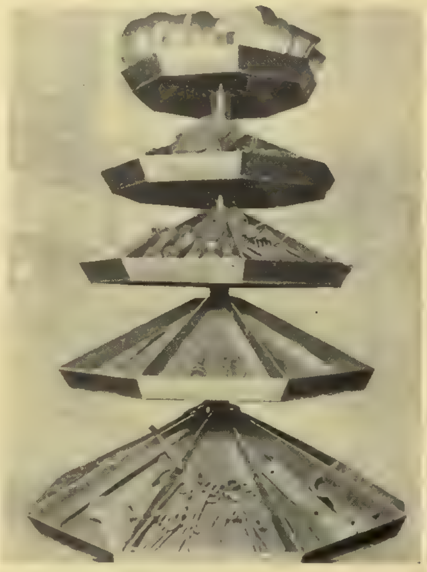
IT WAS noticed in the shop of the Surface Transportation Company, bus subsidiary of the Third Avenue Railway, New York, N. Y., that there was a tendency on the part of the machine workers to slow up in the afternoon. Investigation disclosed the fact that they were standing on the hard concrete floor and that it tired their feet. Wood strip platforms were constructed and installed in front of each machine for the operators to stand upon. These platforms are made in various lengths and widths depending upon their location and the type of the machine they are used with. They are made of 1-in. x 2-in. maple strips, spaced $\frac{1}{2}$ in. apart. They are screwed to three $\frac{7}{8}$-in. x 3-in. maple cross strips. One of these platforms is shown in the accompanying illustration. Since these platforms have been installed, it has been observed that a vast improvement in the production has resulted.



Wood strip platform saves workmens' feet from fatigue due to standing all day on concrete

Electric Railway Journal Maintenance Data Sheet

ROLLING STOCK—MISCELLANEOUS—56



This rack permits of storing a vast quantity of small material and tools in a minimum of floor space

Revolving Tool and Material Rack

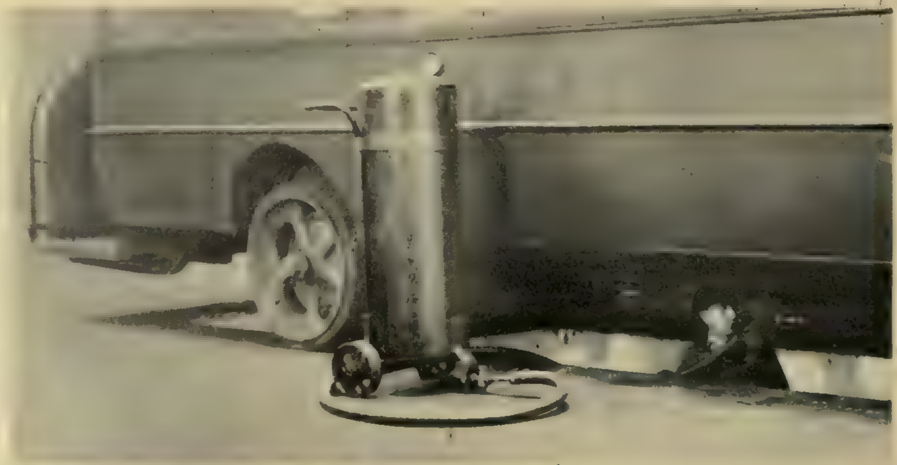
ONE of the most useful devices in the shop of the Staten Island Rapid Transit Railway, Staten Island, N. Y., is a revolving tool and material rack. It is conical in shape, 72 in. high, and occupies a floor space of 2,500 sq.in. There are five octagon-shaped conical trays varying in diameter from 24 in. at the top to 50 in. at the bottom. These trays are made from $\frac{1}{8}$-in. sheet iron and all joints are welded. Each tray is partitioned into eight equal sections. They are welded to a $2\frac{1}{2}$-in. solid vertical shaft and arranged so that the three upper trays can be revolved independently of the two lower ones. The bottom of the shaft supporting the three upper trays is provided with a shoulder fitting into a piece of pipe welded to the top of the lower section of the shaft. This arrangement provides a bearing for the rotary movement of the three upper trays. The bottom of the shaft, to which is attached the two lower trays, fits into a special floor flange providing a bearing for revolving these trays.

Electric Railway Journal Maintenance Data Sheet

BUSES AND TRUCKS—25

Air Tank Converted to Portable Grease Reservoir

GREASING of bus transmissions and differentials has been expedited considerably at the Walden garage of the International Bus Company, Buffalo, by the use of a regular street car air reservoir as a grease supply tank. The tank, mounted in a frame on wheels, can be moved directly to the bus to be serviced. No. 600-W grease is forced under 80 lb. air pressure from the tank to transmission or differential through a 12-ft. length of $\frac{3}{4}$-in. flexible hose equipped with the usual grease gun nozzle and control valve.



Originally built as a street car air reservoir, this tank holds 100 lb. of grease for bus lubrication work

Power and Line Maintenance Notes from Cleveland

Cable Rack Leakage Detector*

By F. W. Braund

Superintendent of Power Conversion Cleveland Railway, Cleveland, Ohio

CONNECTION between positive bus bars of conversion plants and the overhead distribution system of the Cleveland Railway is made by use of flameproof, rubber-covered cable installed in vertical iron pipes at the curb line. These pipes, into which additional insulation in the form of fiber duct is installed, are arranged in a group termed a feeder rack. Some method to determine the leakage between cables and the rack is of immense importance because continued leakage would have rather disastrous effects and perhaps cause serious interruption to service, particularly in non-attended stations.

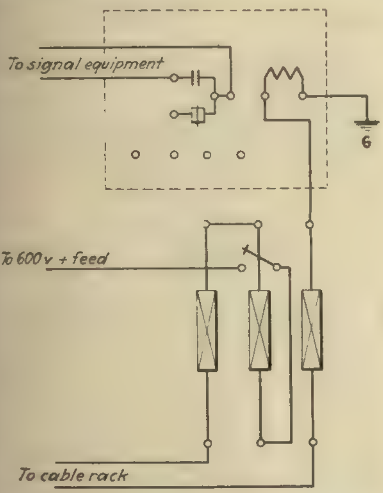


Diagram of connections for cable rack leakage detector

As a solution of this problem a standard voltage regulating relay has been adopted. This is equipped with a coil to operate contacts at approximately 20 volts. The positive lead of the coil is connected to the structural portion of the rack with the negative tied directly to ground. The contacts of the relay are wired so as to operate a signal at the load dispatcher's office in case of automatic plants, and a bell or trouble lamp within manually-operated plants. The accompanying diagram shows the connections.

To facilitate periodical calibrating and testing of the circuits of the rack leakage relay, a test circuit is arranged through resistance tubes from a 600-volt circuit. The amount of resistance is such as to give a feed to the coil of the relay of approximately 20 volts. With this test circuit a simulation of rack leakage potential can be set up on the rack for the purpose of checking the rack leakage detector's functioning.

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Reclaiming Trolley Ears*

By Angus G. Scott

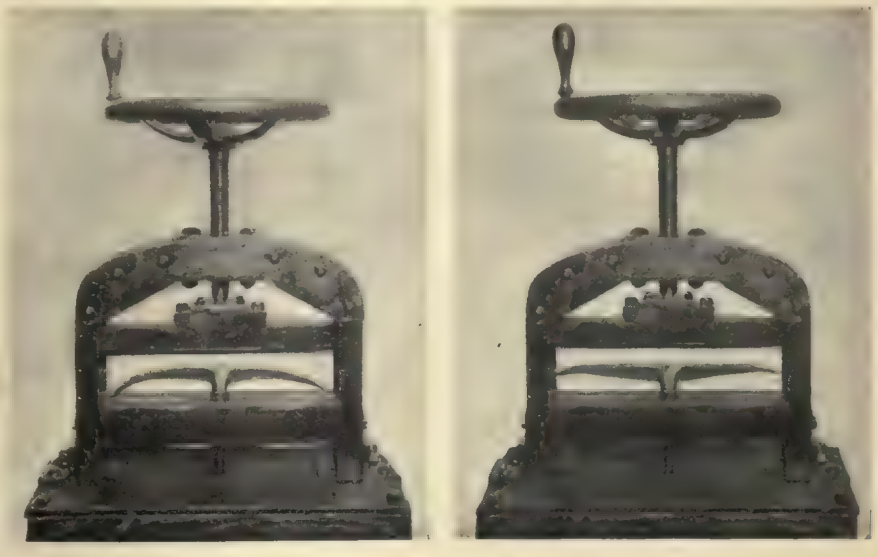
Assistant Superintendent of Overhead Lines Cleveland Railway, Cleveland, Ohio

BY MEANS of a machine for reclaiming slightly worn trolley ears in the overhead department of the Cleveland Railway, ears removed from the wire before they are worn out can be straightened and rendered fit for further service. Pole relocations, span rearrangements, removal of temporary trolley wires, as well as trolley renewals, require the removal of a surprisingly large number of trolley ears long before they are worn out. These ears are in good condition, except for the half moon bend caused by the stripping iron. It was found by experiment that this bend could not be removed satisfactorily or economically by hand. However, the saving possible warranted the construction of a simple machine to perform this operation.

The machine now in use resembles a letter press in appearance, into the base of which a die is fitted. This is cut to conform with the upper side of a new ear. The upper face of the press is movable and consists of a metal block connected to the top of a ball and socket joint, to a screw passing through the upper frame of the press. The lower face of this block consists of a metal strip which is shaped to correspond with the under side or groove of the ear.

The ear to be straightened is placed in the press, as shown in one of the accompanying illustrations. The boss rests on a coil spring extending up through the center of the lower die. The handwheel is turned to close the press and force the ear into the die. Moderate force applied to the wheel is sufficient to accomplish the desired results. Upon opening the press the spring in the base raises the ear to the position shown in the second illustration, from which it may be removed readily. The entire operation can be completed in less than a minute.

After reclaiming, the ears are used on temporary jobs, such as side-track trolley, temporary crossovers, etc. Each ear reclaimed represents a net saving of 45 cents. The Cleveland Railway used 573 reclaimed ears during the year 1928, which resulted in a saving of approximately $257.85.



At right, trolley ear in press for reclaiming. At left, straightened ear after the pressing operation

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*Submitted in Electric Railway Journal Prize Contest.

*Submitted in Electric Railway Journal Prize Contest.

LABOR-SAVING PRACTICES from Rolling Stock

Testing Insulation of Armatures During Baking*

By A. J. Naquin
Equipment Engineer
Rolling Stock and Shops Department
New Orleans Public Service, Inc.,
New Orleans, La.

A TESTING set which provides easy and reliable means for checking the condition of armatures which are preheated or baked is used in the shops of the New Orleans Public Service, Inc. The equipment includes a Leeds & Northrup portable insulation testing instrument of the B battery type. This is wired to a special selector switch from which ten pairs of asbestos covered leads are wired permanently into the baking oven. Phosphor bronze spring clamps form the terminals of the leads inside the oven. The selector switch and the wiring must have a very high insulation resistance value of their own, otherwise a false reading may be obtained.

The accompanying illustration shows the connections of the testing set, the selector switch and the method of carrying the leads into the oven. It has now been in use for more than a year and its use soon showed that the length of time required for baking could be reduced safely. Before the testing set was installed armatures were baked a much longer time than was necessary in order to be on the safe side.

At the present time a reading of 600,000 or more ohms at an oven temperature of 210 deg. to 225 deg. F. is the passing limit. During the past year no armatures were lost during the final high potential test. Armatures which are dipped and baked are given a 1,500-volt test. Rewound armatures receive 2,000 volts. As a further check on the effectiveness of the dipping and baking methods employed, a total of 27 armatures were rewound during the year 1928, from a total of 1,100 motors in service. The cost of the testing equipment used in New Orleans is approximately $300.

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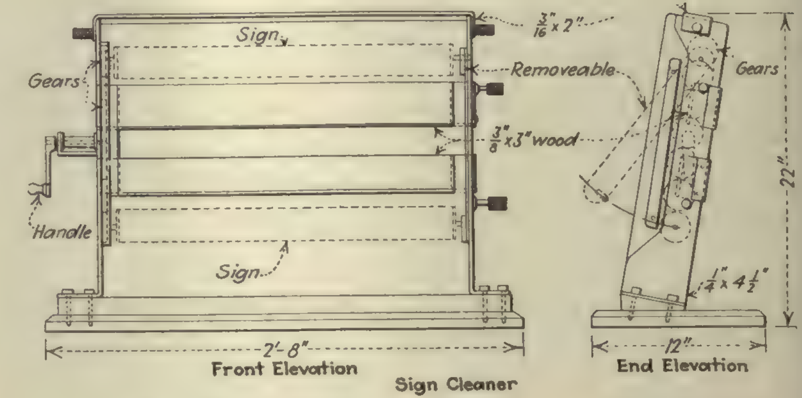
*Submitted in Electric Railway Journal Prize Contest.

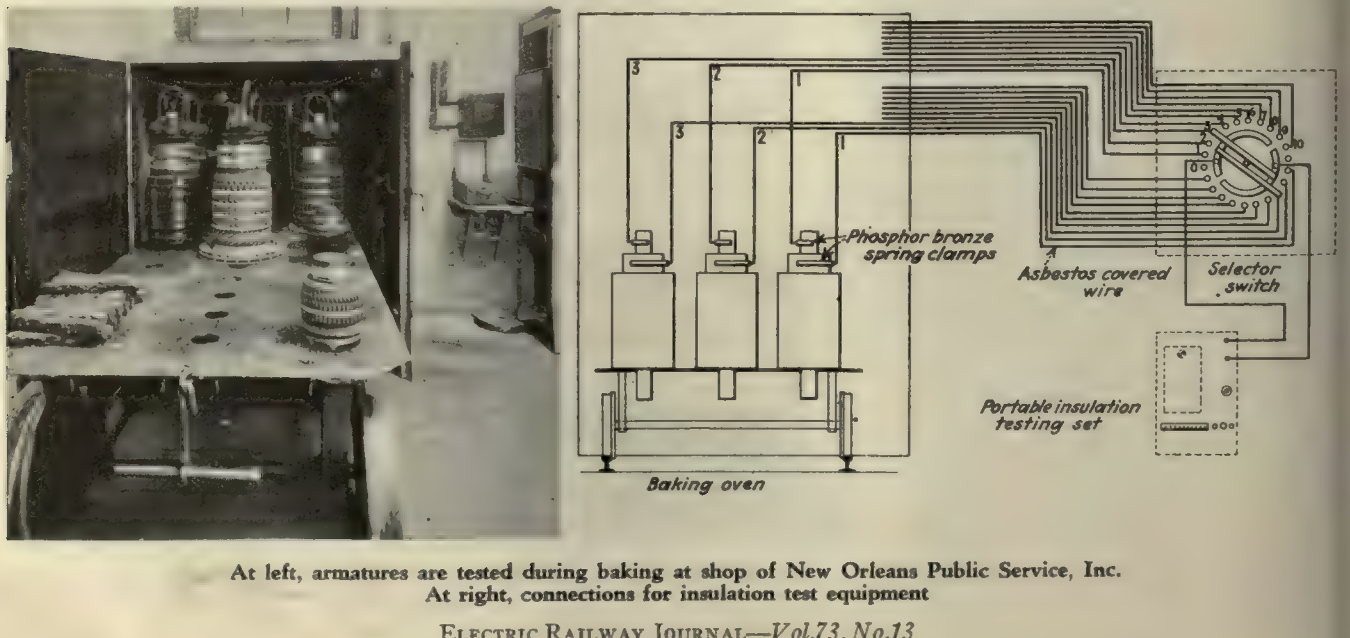


Device used for holding destination signs during cleaning

Roller Sign Holder Assists Cleaning*

By G. H. Watkin
Foreman Brooklyn City Railroad,
Brooklyn, N. Y.

CLEANING of Hunter roller destination signs in the shops of the Brooklyn City Railroad is facilitated by the use of a machine for rotating the signs. The equipment consists of two rollers held in position by two metal side pieces. A series of gears together with a handle connects the two rollers. Metal side pieces are arranged to be detached quickly for insertion and removal of the sign.


3
2
1
3
2
1
Phosphor bronze spring clamps
Asbestos covered wire
Selector switch
Portable insulation testing set
Baking oven

At left, armatures are tested during baking at shop of New Orleans Public Service, Inc.
At right, connections for insulation test equipment

Departments

The framework is mounted on a wooden base. Through the use of this equipment roller type destination signs having 59 destinations, with a width of 22 in., are cleaned in approximately five minutes. Without the machine the cleaning operation would take at least one-half hour.

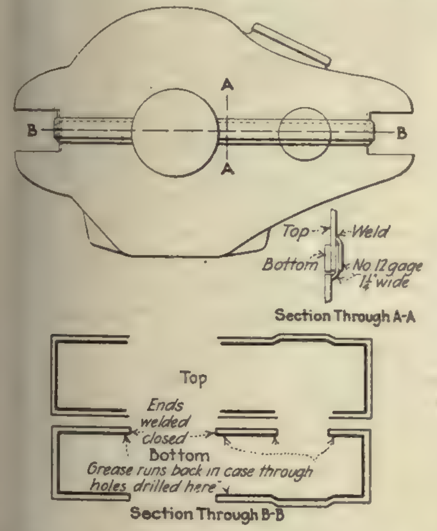
◆

Making Gear Cases Tight*

By Equipment Department

Georgia Power Company, Atlanta, Ga.

To prevent loss of lubricant and to keep water and dirt from getting in gear cases, the Georgia Power Company welds strips to both the top and bottom halves to form a double-tongued joint. Holes of $\frac{3}{16}$-in. diameter are drilled at the bottom of the groove on the lower gear case, so that any grease that might otherwise escape will return into the case. The ends of this groove are welded closed at the axle and armature shaft openings of the case. This prevents any grease from escaping at these points, and reinforces the joint. The outside strip prevents water and dirt that may be thrown up by the wheels from entering the case.



Method of welding strips to gear cases to prevent water and dirt from getting in

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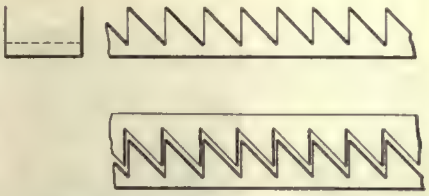
Submitted in Electric Railway Journal Prize Contest.

Preventing Loose Armature Bands*

By F. A. Marsh

Superintendent of Equipment
St. Petersburg Municipal Railway,
St. Petersburg, Fla.

After an extended trial of methods for banding armatures, the Municipal Railway of St. Petersburg has adopted a design wherein the usual type of steel banding wire is used but the clips are omitted and a thin tin metal trough with serrated edges is used in their place. The wire band is wound in the tin trough and then the serrated edges are hammered down and soldered. A solid homogeneous band is thus formed which will not come off in regular service.



Armature band used by the St. Petersburg Municipal Railway is a tin trough with serrated edges

With the new type of band the wires are soldered firmly at the top and bottom, thus creating a solid metal band of great strength. These bands cost 35 per cent more than the usual type, but this additional cost is saved many times through the increased mileage that is obtained and through decrease in the number of loose wire bands and consequent destruction of armatures and fields.

Are You Overlooking the

MAINTENANCE CONTEST?

Entries for the Second Group of Prizes Close April 15

Separate prizes are awarded for items from each of the following departments:

EQUIPMENT	**TRACK**
BUS	**ELECTRICAL**

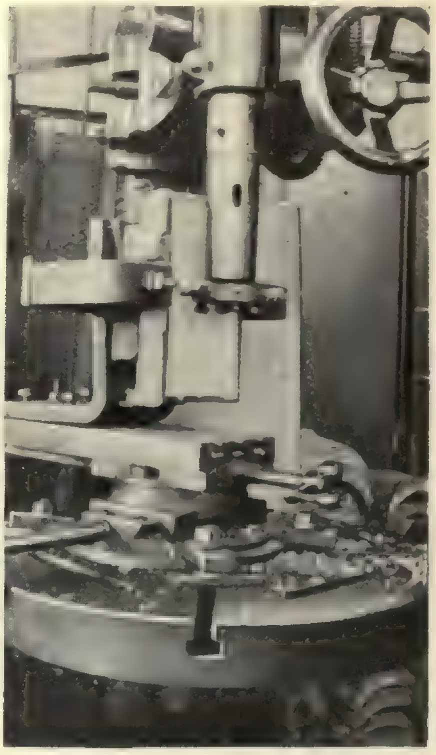
A photograph or sketch together with a letter describing a new maintenance device or method is all that is necessary to enter your ideas.

◆

Journal Bearings Milled in a Drill Press*

By Harvey L. Bullock

Superintendent of Electrical Equipment
Cleveland Union Terminal, Cleveland, Ohio



Drill press attachment for milling journal bearings

An attachment for use with a vertical drill press has been found convenient for facing journal brasses in the White Plains machine shop of the New York Central Railroad. The journal box wedge is attached to an angle plate and the bearing is held in place by two side clamps. A special adjustable milling cutter is used in the drill press spindle. All sizes of journal bearings up to 6¼x11 in. are machined rapidly. Bearings are checked for radius and thickness. This attachment provides a convenient method for doing this work in the absence of a special machine.

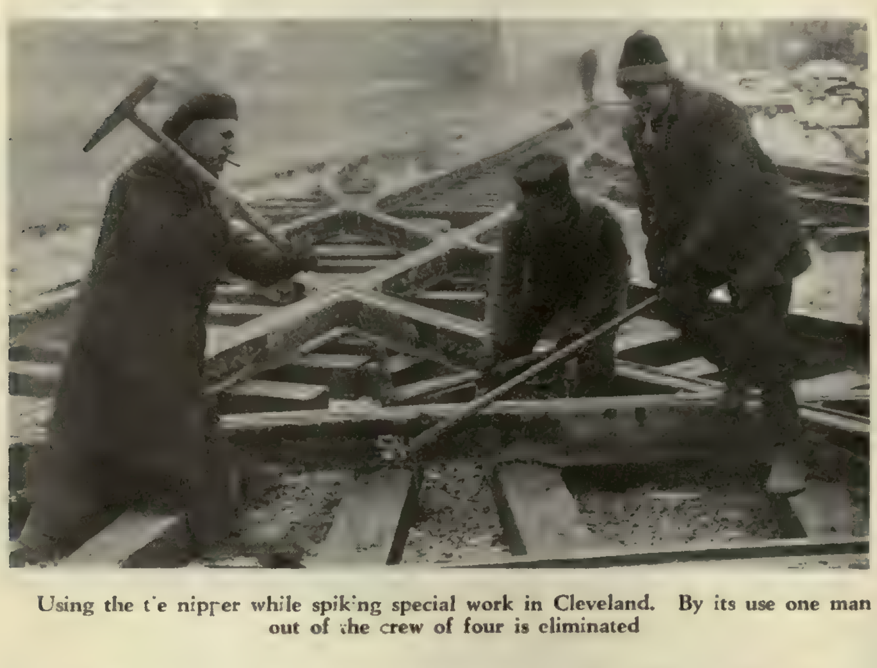
Submitted in Electric Railway Journal Prize Contest.

Four Practical Ways to Cut Track Mai

One-Man Tie Nipper*

By Joseph Croyle
General Foreman Way Department
Cleveland Railway, Cleveland, Ohio

DESIGNED so that pressure on the lever arm brings the tie up snugly and firmly against the base of the rails during the process of spiking, a one-man tie nipper has been used by the Cleveland Railway during the season of 1928 with marked success. It can be used on any section of rail by changing the hangers as shown in the accompanying sketch. The change is carried out easily and with little work. By use of the nipper the number of men employed in the spiking crew is reduced to three instead of four, as is common practice on most roads. Its use also lessens the hazards of flying spikes and swinging mauls, thus minimizing accidents. The nipper is made easily and cheaply by any blacksmith, and costs little more than the two lining bars generally used for this purpose.



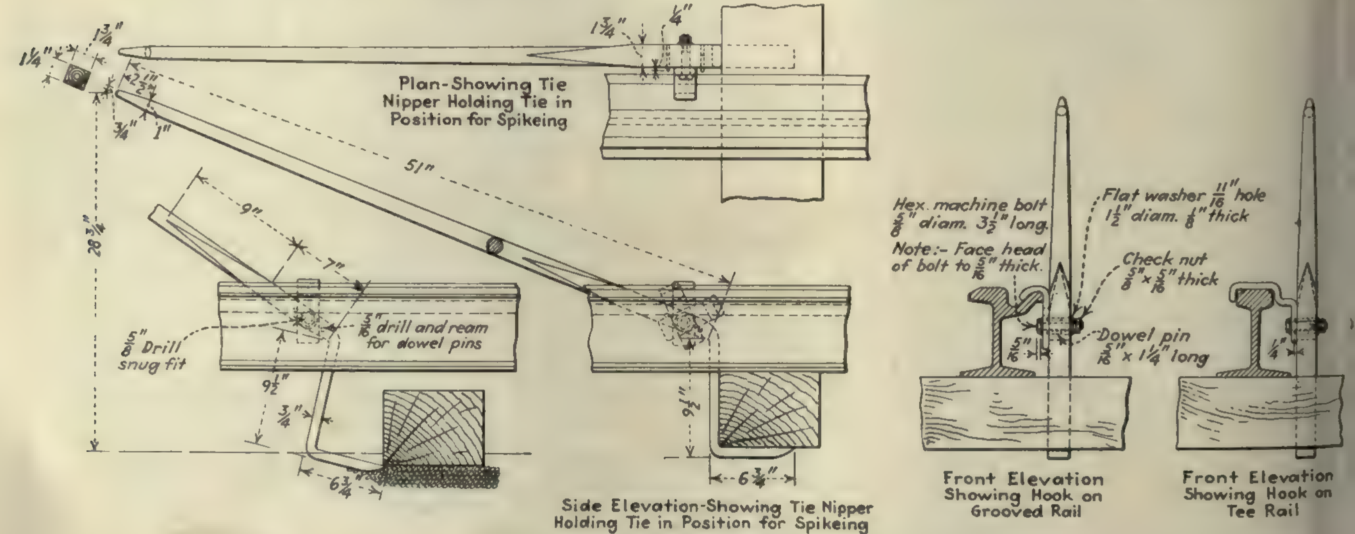
Using the tie nipper while spiking special work in Cleveland. By its use one man out of the crew of four is eliminated

Track Switch Coil Cylinder Vise*

By Charles Herms
General Foreman, San Diego Electric Railway, San Diego, Cal.

CHANGING coils in track switch cylinders was always a two-man job on the San Diego Electric Railway, until a special type of vise was made to hold the cylinder firmly under the heavy strain. A clamp, 8 in. x 16 in., grips the cylinder so rigidly that there is no possibility of slipping. The cylinder is placed in the bottom section of the vise and the top section then placed on. This is hinged on an adjustable eyebolt which is on the opposite side from that shown in the accompanying illustration. With the top in position, the eyebolt *B* is engaged in the slot of the 1-in. x 3-in. plate and the top is screwed down by means of the clamp *A*. The wrench is next placed on the nut and a wedge is inserted in each corner to keep the wrench from slipping off.

The same procedure is used in installing the nut but it is necessary to compress the spring in the cylinder which formerly required two men, but by means of the compression clamps *C* and *D*, this can now be done


1¾"
1¼"
2 1/2"
¾"
1"
1¾"
¼"
Plan-Showing Tie Nipper Holding Tie in Position for Spikeing
51"
9"
7"
28¾"
5/8" Drill snug fit
3/16" drill and ream for dowel pins
9½"
¾"
6¾"
9½"
6¾"
Side Elevation-Showing Tie Nipper Holding Tie in Position for Spikeing
Hex. machine bolt 5/8" diam. 3½" long.
Note:- Face head of bolt to 5/16" thick.
Flat washer 11/16" hole 1½" diam. 1/8" thick
Check nut 5/8" x 5/16" thick
5/16"
Dowel pin 5/16" x 1¼" long
¼"
Front Elevation Showing Hook on Grooved Rail
Front Elevation Showing Hook on Tee Rail

Construction details of the tie nipper and hangers

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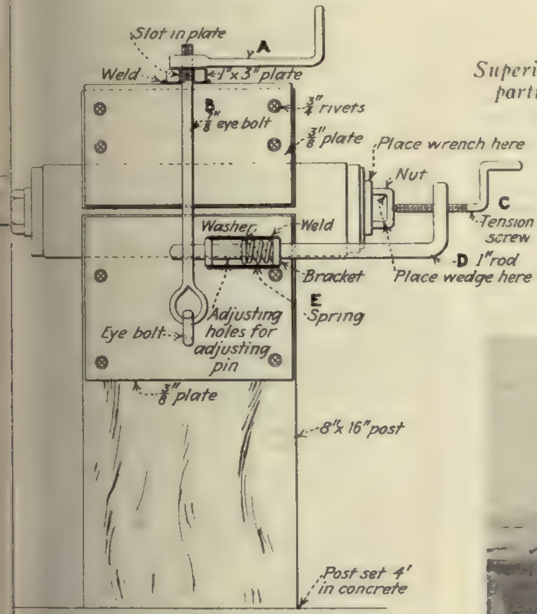
*Submitted in Electric Railway Journal Prize Contest.

enance Costs

by one man. The rod *D* is turned up until the tension screw *C is* centered and forced against the cylinder nut. This compresses the spring *E*, so that it acts as a take-up until the nut has been screwed on a few threads. Otherwise it would be necessary to screw the crank C in at the same rate as the nut is screwed in. Several holes are drilled in the rod *D* behind the spring *E* so as to give a small range of adjustment should it be desired. When not in service the rod *D* is pushed back to the post, so that it will not occupy too much space.



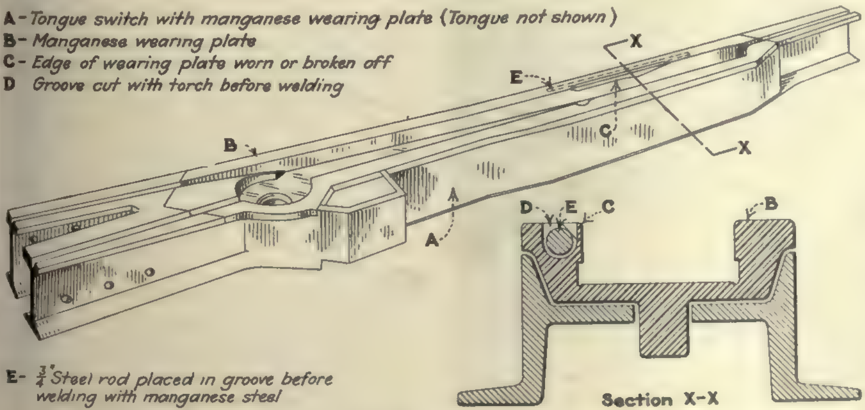
andy vise used for removing coils in track switch cylinders

Repairing Manganese Wear Plates

By Louis T. Botto
Superintendent Maintenance of Way Department San Antonio Public Service Company, San Antonio, Tex.

For several years welders of the San Antonio Public Service Company have experienced difficulty in making repairs to manganese wearing plates in switch frames and in building up surfaces. Hair cracks are found across the middle and ends of the work. The switches have been in service from ten to sixteen years, and are worn to a considerable extent. Often they break through the manganese near the center of the switch piece.

An inexpensive method of making repairs which has been found to stand up remarkably well consists of incorporating a piece of ¾-in. round cold rolled tool-steel into the built-up section. The ends of the steel rod project into the sound part of the insert. A trench is cut with a torch and the steel rod fitted into this, after which it is built up.


A-Tongue switch with manganese wearing plate (Tongue not shown)
B-Manganese wearing plate
C-Edge of wearing plate worn or broken off
D Groove cut with torch before welding
E-¾" Steel rod placed in groove before welding with manganese steel
X
X
A
B
C
D
E
C
B
Section X-X

Method of repairing manganese wear plates at tongue switch

Unloading Trestle Speeds Material Handling*

By C. B. Hall
Chief Clerk Mechanical Department Virginia Electric & Power Company, Norfolk, Va.

Confronted with difficulties in the company's yards due to slow unloading of coal, cinders, ballast, etc., J. C. Newman, engineer maintenance of way Virginia Electric & Power Company, planned and supervised the work of construction of a new trestle, which has resulted in a marked reduction in unloading costs. This trestle is of wood, 96 ft. long and has a concrete base 5 in. thick. Approaches to the trestle are on a 2 per cent grade. Rails are spiked to two 7x14-in. wooden stringers and steel tierods are used to hold the rails to gage. The work of constructing the trestle was completed in ten days at an approximate cost of $750.

Unloading trestle reduces demurrage charges

There is also a considerable saving in time as previously a crew of six men required a ten-hour working day to complete the unloading routine, while now from six to eight cars are unloaded in the same working time.

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*Submitted in Electric Railway Journal *Prize Contest.*

Putting Bus Maintenance Ideas *To Work*

Diagonal Cut in Brake Lining Lessens Glazing

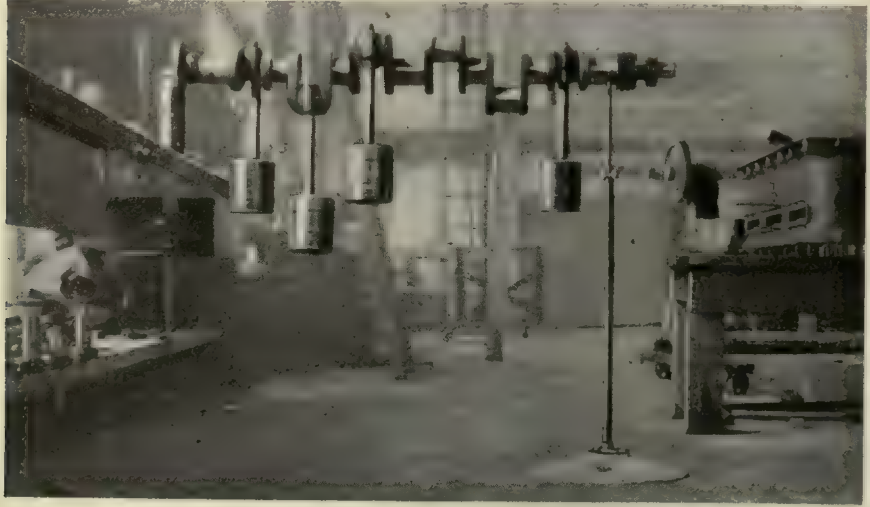
GROOVING the brake lining across the middle for its full depth with a diagonal cut ½ in. wide, at a 60-deg. angle, has been found singularly effective in reducing trouble with the Timken mechanically-operated brakes on the Yellow coaches of the International Bus Company, Buffalo, N. Y. This brake lining, which is 15½ in. long, 5 in. wide and $\frac{5}{16}$ in. thick, was found to be subject to glazing, which, in turn, produced squeaks and caused irregular wear. The groove apparently has been successful in affording an exit for particles of dirt, gravel, etc., which otherwise would remain inside to be ground into the surface of the brake lining by the shoe and cause trouble.

A diagonal groove cut across the face of the brake lining supplies an outlet for dirt particles that ordinarily would be ground into its surface

Crankshaft Supports for Fitting Connecting Rods

FITTING connecting rods to a crankshaft was always a cumbersome job in the shop of the Surface Transportation System, bus subsidiary of the Third Avenue Railway, New York, N. Y., until a method was adopted for supporting the shaft, as shown in the accompanying illustration. The shaft flange is now bolted to a bracket fastened to the upper surface of a work bench near the front edge. This bracket is made of ½x6-in. material. The foot is 4½ in. long and the upright 6½ in. long. The other end of the shaft is supported by a special adjustable stand. The base of this stand is made of sheet iron, is 14 in. in diameter and conical in shape. It is fitted with a ¾-in. pipe flange. A piece of ¾-in. pipe 26 in. long is screwed into this flange and is fitted with a winged cap at the top. This cap is drilled and tapped for a ½-in. bolt thread. A ½-in. rod provided with a jaw 3¼ in. wide and 1½ in. deep and threaded for a distance of 10 in. is screwed into the winged cap. Turning this cap to the right or to the left increases or decreases the height of the stand.

This arrangement permits of accessibility to all parts of the shaft, allows for free circular movement of the rods being fitted and tends to increase the production.



Method of supporting crankshaft while connecting rods are fitted

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Heated Chamber Gives Clear Vision for Cars and Buses

TO PREVENT the formation of ice on the windshield of a bus, a heated chamber, 30 in. wide at the top with the bottom shaped in a circular arc slightly shorter than the length of a swinging wiper, has been devised by Joseph O. Marcelais, car mechanic for the Fitchburg & Leominster Street Railway. The back of this chamber is a piece of slightly tinted optical glass fitted into the frame. The front surface is the windshield itself. Three resistance wires are run in the base of the frame. Perforations provide for circulation of air to prevent sweating. A three-way switch connects either one or all three of the wires for use, depending upon the severity of the weather. A cork filler is used to insulate the chamber from outside conditions.

Heated chamber installed on the windshield

When the air inside the chamber is heated, snow, ice and mist formations disappear and clear vision is obtained. The tinted glass protects the operator from the glare of approaching lights. It is also claimed to ease the strain on the eyes of the operator when glistening snow is on the ground.

NEWS *of the Industry*

Supreme Court to Get Baltimore Case

An opinion just handed down by the Maryland Court of Appeals denies the United Railways & Electric Company, Baltimore, Md., its appeal for a higher rate of return. The opinion concludes the case in the Maryland courts and opens the way to carry the matter to the Supreme Court.

Some months ago the Court of Appeals remanded the case to the Maryland Public Service Commission. At that time the Supreme Court dismissed an appeal on the part of the company, holding that the case was still pending in the Maryland courts.

In the earlier case the company charged that the 6.25 per cent return fixed by the commission was confiscatory. The court remanded the case, however, on the ground that the Public Service Commission had based the depreciation allowance on cost instead of value. When the case was reconsidered by the commission the company was granted an increase in fare from 9 cents or three tokens for 25 cents to 10 cents cash or four tokens for 35 cents. The case again was carried through the courts and the recent opinion of the Court of Appeals brought it to an end in the Maryland tribunals.

Terms of Toronto Agreement Stand

No increase in wages, no vacation with pay as asked for by the men, and the abolition of extra pay for Sunday work, featured the report of D. W. Saunders and D. L. McCarthy, acting as arbitrators between the Toronto Transportation Commission and the local railway men's union.

The report, is not subject to appeal. It provides for overtime pay after the usual eight-hour-day, plus a half-hour leeway for shopmen and an extra half run for trainmen.

James Simpson, who represented the men, dissented. The arbitrators, in effect, rule that the old agreement will stand except for the fact that overtime will not be paid for Sunday.

A new element enters into the situation by reason of the offer of Manager Harvey, backed by the Board of Control, to restore the overtime rate for Sunday work in return for a three-year agreement, instead of the two-year award made by the board. This is a resumption of negotiations on a new line. As the Toronto *Globe* sees it, Mr. Harvey is evidently prepared to protect the public interests in so doing, because under the circumstances he represents the patrons of the system.

In its comment that paper says:

> If his proposal involved an increase in fares he would find himself in trouble. Otherwise he is to be commended for making the offer. This overtime rate has been paid for a number of years, and, while the chairman of the board evidently believed that it was out of line with the usual overtime principle, it is doubtful if the people would object to paying the men working Sunday the extra sum for the loss of this universal day of rest.

Franchise Accepted in Jacksonville

John P. Ingle, manager Jacksonville Traction Company, Jacksonville, Fla., filed the company's acceptance to the proposed new franchise passed by the City Council on March 12. The matter is now ready for submission to the electors of Jacksonville, who probably will pass on the franchise after the general city election in June. The action of the Council and Mr. Ingle concluded negotiations between the city government and the company for more than two years.

When Mr. Ingle filed the formal acceptance of the franchise provisions on behalf of the company and Stone & Webster, Boston, Mass., operators of the company, he said in part:

> While this franchise does not contain all of the provisions for which the company has contended and believed would be of mutual benefit to the city and the company, it is essential that the negotiations which have extended over a period of three years be ended.
>
> We shall do everything in our power to give the city adequate transportation service, relying on the co-operation of City Council and the public in our efforts to fulfill these obligations.

Mayor John T. Alsop, Jr., expressed satisfaction at the action of the Council and the company, and indicated that he would sign the bill as soon as it was presented to him.

Improvement on Worcester Equipment Follows Editorial

Prompted by an editorial in the Worcester, Mass., *Telegram*, the Worcester Consolidated Street Railway has decided to have the words "emergency door" painted in red letters, 1½ or 2 in. high, on the emergency exit of every bus which the company operates. Work has already started on order of Vice-President Howard R. Whitney. Mr. Whitney investigated and found that the editorial was right in stating that the emergency doors at the rear of the buses are "so integral with the side of the vehicle as to be almost unseen despite signs."

North Jersey Commission for Co-ordination

The North Jersey Transit Commission submitted to the Legislature on March 11 a report presenting in further detail its plans for the development of transit in the metropolitan area of New Jersey with a view to its ultimate co-ordination with the interstate system outlined in the report of 1926.

The report recommends an elective northern New Jersey metropolitan board with power to finance, construct and administer the rapid transit system of the district, with supervision over water supply, sewage disposal, reclamation of salt meadows and subdivision control. The Port of New York Authority, as the most practicable existing agency with power to construct interstate traffic connections, is suggested as most suitable for co-operating with such a board.

The report explains that the commission's studies have been made available to the suburban transit engineering board and that until the task of co-ordinating the views of diverse locality interests affected has been completed, the commission will take no further steps. In the board's opinion Newark, by reason of its population, wealth, area and variety of industrial plants, is today the natural focus about which North Jersey development must center. To regulate and promote this development the commission recommends the creation of an elective North Jersey metropolitan board along lines suggested in a Senate joint resolution now pending in the Legislature.

Preparing for the Operation of New York's New Subways

Indications are that the city of New York will buy its power from the New York Edison and allied companies for the new municipal subways in course of construction. Chairman John H. Delaney, of the Board of Transportation, presiding at a hearing on March 26 said that bids, based on a price per unit of power delivered, would be submitted probably by June 1.

Unless the city builds its own power plant for supplying the new municipal subways, which is not contemplated, the New York Edison Company is practically the only source from which the city can draw. Even now both the Brooklyn-Manhattan Transit Company and the Interborough Rapid Transit Company purchase power. The city will go through the form of advertising bids because of the legal requirements.

The city decided against building its own power plant to supply the new city-owned subways on the advice of Stevens & Wood. They reported that great changes were taking place in methods of power development and that the city might find it advisable to make a contract for ten years with a private power company. Power requirements are estimated at 18,000 kw. the first year, rising to 209,000 within ten years.

Chairman Delaney asserted that the city would begin operation of the first part of its new subways probably in the spring of 1932. The section to be placed in operation is that of the Eighth Avenue-Washington Heights line from Fulton Street to 207th Street. Within a few months after the opening of that line operations will be extended to Brooklyn. Following the opening of the line to Brooklyn operations to Queens will be begun. The entire municipal system should be in operation by the middle of 1932.

Reduced Fares on Indiana Lines

To stimulate the passenger business during the coming summer and fall, the Evansville, Suburban & Newburgh Railway operating to Newburgh and Boonville, Ind., from Evansville, Ind., and the Evansville & Ohio Valley Railway operating railway lines to Grandview, Ind., and bus lines to Owensboro and Henderson, Ky., and to Mt. Vernon, Ind., will offer reduced half-fare rates on holidays and over the weekends.

Change in Commutation Tickets on Chicago Interurban

The Chicago, Aurora & Elgin Railroad has announced that commutation tickets now used between Chicago and the Fox Valley cities are interchangeable and may be used between Chicago and other points on the line. The 10 and 25-ride tickets, sold at $8 and $19 respectively, are good for one year from date of sale, but the 60-ride ticket, sold for $16, is good only for the calendar month in which it is issued.

Milo R. Maltbie Retained by Philadelphia

Following a conference of city officials of Philadelphia with Milo R. Maltbie, public utilities expert, it was announced that Mr. Maltbie and three of his assistants would return to Philadelphia from New York to work in conjunction with the firm of Haskins & Sells, accountants originally engaged to audit the books of the Philadelphia Rapid Transit Company. Mr. Maltbie's efforts, however, will be directed more specifically toward the engineering phases of the investigation.

Parking Ban in Toledo Suggested

A city traffic commission appointed by Mayor W. T. Jackson, of Toledo, Ohio, has recommended to the City Council an ordinance to bar all parking in a downtown loop area.

Railroading in the Revolutionary Zone

While the average Mexican soldier, regular or irregular, is a notoriously bad shot, he is by the same token, inclined to be prodigal in his expenditure of ammunition, with resulting danger to the innocent bystander. So when the latest disturbances along the border got fairly under way and it began to appear that Juarez was about to change hands again, F. J. Gannon, manager El Paso Electric Company, influenced, possibly, by the slogan "The Street Cars Can't Dodge," and not caring to have his trainmen live the lives of clay pigeons, withdrew his rolling stock to American territory until the unpleasantness was over.

Long experience has taught them to do things well in El Paso. Whereas on the usual railway property it is customary to have weekday, Saturday and Sunday schedules, the El Paso management provides for revolutionary and peace-time schedules, and when the dispatcher learns that another revolt has broken out across the line he simply says "ho hum," or words to that effect, posts the revolutionary schedule on the bulletin board, and without further instruction the trainmen arrange to turn their cars back at the river. Then follows the regular rush-hour problem of hauling American spectators to points of vantage along the river bank on the United States side from which to view the proceedings. Ordinarily, a good, stiff border battle, in which the principals are well known, will draw a bigger crowd than a bull fight. Attendance at a border battle, however, is not unaccompanied by hazard.

Last Car from Mexico Seeks Safety in U. S. A.

As previously stated, Mr. Gannon, who knows his *vivas*, had been advised that an attack was impending, and had turned off the power and withdrawn his cars to points of safety, with the consequence that the property was damaged only to the extent of a couple of broken span wires and some shattered insulators. On the other hand, the revoltosos displayed their thoughtfulness in cleaning up the damage within a few hours after the fracas so that Americans seeking their week-end stimulants could be accommodated with as little delay as possible. "Their thoughtfulness in this regard," writes Mr. Gannon, "probably prevented a heavy mortality on the American side of the line."

Now the situation is static, but Mr. Gannon expects a return to normalcy when the federalistas attempt a re-take. "My only fear," he writes, "is that the federal forces will use airplanes and bombs, and if they are as poor shots with bombs as they are with rifles El Paso will probably catch fits when they attack Fort Hidalgo, 4 miles away."

Prospects Bright for Chicago Legislation

Representatives of the Chicago electric railways, who during the week ended March 23 were reported to have withdrawn all opposition to the six legislative enabling bills, drafted by the citizens' traction settlement committee, have since notified the committee that they will not assent to any fixed-term franchise.

The six original bills in the settlement program, however, have been approved by the local transportation committee of the City Council.

In a formal statement introduced at a public hearing on the bills on March 25, the companies declared that they would not endorse the recommendation of the citizens' committee that a seventh bill be drawn to empower the city to grant a 40-year term franchise or an indeterminate permit.

The bill approved by the companies and the local transportation committee during the week ended March 23 authorizes the city to grant either a twenty-year franchise or a terminable permit. The statement protested against any change in the bills in their present form and warned the committee that such changes would stir up new issues and cause further delay. The companies have withdrawn their demand that the home-rule proposal should be conditional on the granting of a terminable permit to the new consolidated company.

The local transportation committee, however, is said to favor the terminable permit as the best form of contract with the company but desires the power to grant a 40-year franchise merely for the purpose of stopping opposition to the Council's program in seeking a referendum vote. In discussions on the 40-year amendment, several Aldermen argued that the twenty-year grant would not permit sound financing.

The public hearing sponsored by the local transit subcommittee was marked by a fiery denunciation of the measures by Judge John M. Harlan, representing the F. J. Lisman interests of New York. Mr. Harlan charged that under the proposed legislation the city would surrender to the new company all authority over the use of its streets in return for home rule.

As soon as the City Council passes on the bills, they will be introduced in the General Assembly at Springfield. The entire City Council membership plans to appear before Governor Emerson to ask his support of the program.

Halt in Wage Action in Ontario

As no relief in the way of additional revenue is in sight for the London Street Railway, London, Ont., it appears that no further action will be taken by the employees to enforce the award made by the Railway Board. As a matter of fact, the city has not sufficient power to increase the fares as under the railway act for Ontario municipalities cannot increase railway fares beyond a maximum of 5 cents and the city so far has taken no action to have this clause amended or changed by the Provincial Legislature.

During 1928 many conferences were held with the employees of the company in reference to their application for an adjustment of wages filed with the company on Jan. 30, 1928. Under the wage agreement, notice may be given by the employees under a 60-day clause, asking for a revision of the wage scale, and this notice was served by the employees on Jan. 30. At all of these conferences the employees were advised that the company could not pay any increase in wages under the existing franchise with the city of London. However, during the month of November the employees threatened to go out on strike and the Ontario Railway and Municipal Board of Toronto, Ont., held a session to ascertain if anything could be done to settle the question.

Both the employees and the company agreed to refer the matter to the Ontario Railway and Municipal Board for investigation, and a further meeting was arranged by the Railway Board at Toronto on Dec. 18. The company presented statements of operating costs and information in reference to the additional operating costs on an adjustment of wages on the basis of the scale presented to the company by the employees at the previous conference.

The Ontario Railway and Municipal Board on Dec. 29, 1928, forwarded its award. Briefly, the board favored an increase of 2 cents an hour to motormen and conductors, increasing the general scale from 48 cents to 50 cents an hour and to one-man car operators an increase of 2 cents an hour which would increase the scale from 53 to 55 cents an hour. Bus operators were awarded an increase of 5 cents an hour, raising their pay from 50 to 55 cents an hour. A general increase of 2 cents an hour was awarded to all shopmen, trackmen and linemen. The award was dated from Dec. 1.

The management took the stand that, as no funds were available to pay wages on the basis of the award, it would be impossible to comply with the award. Employees were advised of this fact and at the same time informed that it would be necessary to have the matter referred to the directors of the company for their decision. The directors met on Feb. 6 and decided that it would be impossible to operate the railway and pay the award made by the board and the employees of the company were advised by letter on Feb. 8 that the directors regretted that they could not comply with the award made by the Ontario Railway and Municipal Board without creating a serious deficit in the operation of the railway.

No further action has been taken by the employees, who appear to realize that the company cannot meet the award of the board. In fact, on several occasions pay day has been deferred on account of insufficient funds to meet wages when due.

◆

Paving to Be Done By Sioux Falls Company

The City Commission recently passed a motion requiring the Sioux Falls Traction Company, Sioux Falls, S. D., to pave between the street car rails on Sixth Street between Nesmith and Van Eps Avenues and on Van Eps Avenue from Sixth Street to Tenth Street. In the motion the city attorney was instructed to take steps to compel the company to pave, as it was instructed to do by the Supreme Court following a decision in the case of the city of Sioux Falls vs. the Sioux Falls Traction Company.

◆

Railway Men on Baltimore Safety Council

Thomas A. Cross, a vice-president, and H. B. Potter, vice-president and general manager of the United Railways & Electric Company, Baltimore, Md., have been elected members of the executive committee of the Baltimore Safety Council.

◆

Parking Rules in Chicago Amended

Amendments to the ordinance prohibiting week-day parking on downtown streets of Chicago were adopted recently by the City Council. These shorten the time limitation one-half hour in the late afternoon and correct certain legal errors in the original ordinance. The present no-parking hours on "loop" streets from 7 a.m. to 6.30 p.m. will be shortened to 6 p.m. upon recommendation of the committee on street traffic regulation.

The traffic committee which considered the matter of amendments also recommended that the ordinance be altered to permit trucks to park not more than 30 minutes for loading or unloading. The former ordinance, now under review by the courts, prohibits automobiles from "stopping" anywhere in the "loop," instead of prohibiting "parking." This provision was not worded in accordance with the recommendations of the traffic committee of the Chicago Association of Commerce, which sponsored the ordinance. The amended document corrects this defect and was passed with practically no organized opposition, indicating the success of the no-parking restriction after more than a year's experience.

City Directors Play Small Part in Philadelphia Deliberations

Declaring "no self-respecting citizen could continue on the Philadelphia Rapid Transit board of directors as a representative of the city unless there is change," Ernest T. Trigg caused a stir among City Councilmen on March 21 in a criticism of Philadelphia Rapid Transit business methods.

During the long discussion of the matter in which he contended city directors on the board of the railway company have been reduced to a situation of complete unimportance in formulating its plans and policies, Mr. Trigg contributed an earnest statement calling for action by City Council, but he qualified his remarks by saying he believed the Philadelphia Rapid Transit Company would act to make the city directors play the part in the affairs of the company they should.

◆

Denial Issued on Equitable Coach Application

Transit Commissioner Leon G. Godley denied on March 28 the Equitable Coach Company's application for a certificate of convenience and necessity to operate buses in Manhattan, Brooklyn and Queens, New York, under the franchise voted by the Board of Estimate on July 28, 1927. The franchise itself would be revoked by the board shortly, it was said at City Hall. Commissioner Godley's decision was on the ground that his inspection of a financing plan submitted to him by the company recently disclosed that the Equitable was not only "a financial cripple from the start" but was "suffering from a complete financial paralysis" and was therefore in no position to supply a bus service commensurate with the public need.

Revocation of the franchise will end further investigation by the city of the "slush fund" charge raised in connection with the Equitable's unsuccessful attempt to put through a merger of its Brooklyn and Queens routes with the Brooklyn-Manhattan Transit surface lines.

◆

New York Session Ends

The 152d session of the New York State Legislature adjourned on March 23 with many bills dying in committee, among them the transit unification bill for New York City. Measures that passed of interest to utilities were the two-cent gasoline tax effective May 1 and the investigation by commissions of practical working of the public service law. Measures that failed were the ambulance-chasing legislation and the suburban passenger traffic inquiry by Port Authority. Bills affecting New York City which failed of passage were the creation of a sanitation department and the board of control for unified city operation of subways, to which reference has been made before.

Convention Plans Fast Maturing

Program practically completed. Unusual facilities for the exhibits, with good arrangement for rolling stock display

REPORTS of standing and special committees of the American Electric Railway Association made at a regular meeting of the executive committee held at association headquarters in New York on March 22, 1929, indicate that the association's work for the year has been advanced since the last meeting, and that plans for the annual convention are rapidly taking definite shape. At the same time, reports made by the presidents of the several affiliated associations reflect the progress being made by committees of the Accountants, Claims, Engineering and the Transportation and Traffic Associations.

T. A. Kenny, chairman of the program committee, reported that the convention program has been practically completed, and that the various speakers selected are being invited to participate. Chairman J. H. Hanna, of the exhibit committee, expressed his gratification at the progress made in completing the new exhibit hall at Atlantic City, and was quite confident that the facilities afforded by the new auditorioum would amaze and delight the entire industry.

Chairman Hanna called particular attention to the unusual facilities that will be available for a representative car exhibit. The space for showing cars will be on a decorative plaza which is being built on the ocean side of the boardwalk in front of the new auditorium, with space for fifteen city type cars on curved tracks laid on this plaza and with direct track connections from one of the streets at the side of the auditorium. In this setting, it was the consensus of opinion, this year's car exhibit will be in the finest spot for the purpose to be found anywhere in the country. It was considered important, therefore, that a really representative exhibit of modern cars be staged for the publicity value to the industry which would result from the location that is to be available this year.

Chairman Hanna reported that there have been only two affirmative replies to letters of inquiry sent to car builders regarding their plans for exhibiting modern types of cars, and he requested the co-operation of the executive committee and the special manufacturer's committee in arousing the car builders to an interest in the importance of this exhibit.

Report on Pacific Coast Conference

Reports of other standing and special committees included those on publicity, membership, finance, national relations, publications, hotel arrangements, Coffin Award, education, insurance, research, taxation and street traffic economics.

Managing Director L. S. Storrs reported on the conference of Pacific Coast executives recently held in San Francisco under the auspices of the Advisory Council. He felt that the plan of holding a series of similar conferences in various sections of the country should be pushed. J. N. Shannahan, chairman of the Advisory Council, asked for an expression of opinion from the members of the executive committee as to the value of sectional meetings of this kind. It seemed to be the consensus of opinion of the entire executive committee that such sectional meetings for principal operating executives, with no fixed program, for the frank discussion of the problems and outlook for the industry, are very much worth while. Past-president W. H. Sawyer declared that the justification and need for such meetings was so manifest as not to warrant discussion, the only question being the number of meetings of this kind which the chairman of the Advisory Council, the president of the association and the managing director could find the time to attend.

Managing Director Storrs informed the executive committee of his acceptance of the position of executive chairman of the board of directors of the United Railways & Electric Company, Baltimore, which would necessitate his resignation as managing director, to become effective April 1, 1929. Mr. Shannahan expressed the regret which the industry, the association and the Advisory Council would feel at this loss of the active services of Mr. Storrs, and suggested the appointment of a committee to draw up suitable resolutions regarding the service which Mr. Storrs has performed for the industry during the four years since he undertook the work as managing director.

C. D. Emmons, president United Railways & Electric Company, Baltimore, and past president of the association expressed his gratification of the fac that the Baltimore management ha chosen Mr. Storrs, with his broad view of the industry's problems and outlook to apply this wide experience towar the solution of Baltimore's transportation problem. Mr. Emmons said tha the association's loss will be Baltimore's gain and that the entire United Railways organization would welcome Mr Storrs' leadership.

Those present at the meeting of the executive committee included the following: President J. P. Barnes, presiding; J. H. Hanna, C, E. Morgan, G. A. Richardson, L. S. Storrs, R. P. Stevens, O. H. Bernd, L. F. Wynne, W. H. Boyce, T. W. Casey, Paul E. Wilson, E. P. Waller, W. F. Cutler, J. R. Fitzpatrick, H. B. Potter, Carroll Burton, M. B. Lambert, W. M. Wampler, W. H. Sawyer, F. R. Coates, J. N. Shannahan, C. D. Emmons, F. W. Doolittle, T. A. Kenny, H. L. Geisse, C. S. Hawley, J. W. Welsh, Labert St. Clair, Leslie Vickers, E. J. Murphy, J. A. Miller, Jr., Charles Gordon, Freddie Dell,G. C. Hecker, E. E. Bodine. The tentative date selected for the next meeting is May 2, 1929, at Washington, D. C., at which time the United States Chamber of Commerce will convene in annual meeting.

◆

CAR BUILDERS!

Action

has certainly started on the

1929 Car Exhibit

Space applications won't be mailed until

APRIL 12

But

Twin Coach Company
Perley A. Thomas Car Works

have already requested Track Space for Street Cars on the

BOARDWALK PLAZA AT ATLANTIC CITY

Splendid for a Starter!

Indianapolis Employees Press Wage Demand

Oral arguments were heard recently by the Indiana Public Service Commission on the motion of the Indianapolis Street Railway to postpone until next year further consideration of the request of the employees of the company for a wage increase. The case originated several weeks ago when the employees filed a formal petition for a wage boost. A company motion to dismiss the petition was overruled shortly afterward and then the company granted slight increases based on the increase in its net earnings in 1928 over those of 1927.

Attorneys for the employees insisted that the original petition should be considered at once by the commission. They suggested that the company and its employees "might get together and iron out their differences."

David E. Watson, attorney for the company, contended the company's present financial condition will warrant no wage increases. He said that compulsory payment of more than a company is able amounts to confiscation of property.

◆

Ten-Cent Fare Sought in St. Catharines

The Canadian National Electric Railways has applied to the City Council of St. Catharines for a 10-cent fare on its local lines. Under the franchise, the railway has power to charge 8 cents. The present fare is 7 cents.

Equipment Men Urge Early Reservations for Meeting

Selection of the Lafayette Hotel, Lexington, Ky., as headquarters for the July 24-26 meeting of the Electric Railway Association of Equipment Men, Southern Properties, has just been announced by A. Taurman, president. Rates for rooms are $2.50, $3 and $3.50 for a single room and $5 and $6 for a double room. Members are urged to make reservations early. If reservations are not available at the Lafayette, members are referred to the Phoenix Hotel, a short distance from the Lafayette.

Preparation of the program is under way and suggestions on topics for discussion are solicited.

◆

Vancouver "Buzzer" Has New Top

The decoration or heading for the front page of "The Buzzer," official pamphlet of the British Columbia Electric Railway, Vancouver, B. C., was selected by W. G. Murrin, president, out of 158 submitted in the recent contest. A graphic representation shows Mr. Public pressing the button for service, and the trainmen, the bus driver, the mechanic, the office man and the stenographer rushing in the manner of good public utility employees to give him service. The design is the work of F. A. Wilson, who received the $25 prize.

◆

Gas Tax Passes in Illinois

The Illinois 3-cent gasoline tax bill was signed recently by Governor Emerson, after being passed by both houses of the Legislature by a wide majority of votes. It will go into effect on Aug. 1. Provision is made for a tax of 3 cents a gallon on gasoline used in all motor vehicles operating over the public highways of the state. It provides a division of the tax money of 2 cents to the state and 1 cent to the counties. The estimated annual yield of $21,000,000 will be used for completion of the state's hard roads system. Opposition to the measure came chiefly from Chicago members who asked for an equal split of the revenue between the state and the counties and a share to be used on maintenance of city streets in Chicago.

◆

Help in Paying for Paving Sought in Baltimore

The United Railways & Electric Company, Baltimore, Md., has asked the city to finance the company's share of paving on several streets to the amount of $210,000, the United to repay the money in five annual installments without interest. A similar agreement is said to have been entered into under a previous administration. The Board of Estimate has taken the subject under consideration.

COMING MEETINGS OF *Electric Railway and Allied Associations*

April 5 **— Metropolitan Section, American Electric Railway Association, 33 W. 39th Street, New York, N. Y.**

April 12 **—Maryland Utilities Association, Annual Meeting, Hotel Emerson, Baltimore, Md.**

May 1-3 **—Indiana Public Utilities Association, Indiana Gas Association and Indiana Electric Light Association, annual joint convention, Hotel Gary, Gary, Ind.**

May 13-15 **— National Highway Traffic Association, annual meeting, Stevens Hotel, Chicago, Ill.**

May 15 **—Association of Electric Railway Equipment Men, Middle Atlantic States, semi-annual meeting, Wilmington, Del.**

June 3-6 **—National Association of Purchasing Agents, Annual Convention, Hotel Statler, Buffalo, N. Y.**

June 5-7 **—Canadian Electric Railway Association, annual convention, Montreal, Quebec.**

June 21-22 **— New York Electric Railway Association, Bluff Point, N. Y.**

June 27-28 **—Central Electric Railway Association, Michigan City, Ind.**

July 24-26 **—Electric Railway Association of Equipment Men, Southern Properties, Lafayette Hotel, Lexington, Ky.**

Aug. 15-16 **— Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.**

Aug. 27 **—National Association of Railroad and Utilities Commissioners, Glacier National Park, Mont.**

Sept. 28-Oct. 4 **—American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium, Atlantic City, N. J.**

Paving Relief in Alexandria, Va.

A measure relieving the Mount Vernon, Alexandria & Washington Electric Railway of its proportionate cost of permanent improvements, along its right-of-way in Alexandria, was adopted by the City Council on March 22.

This action by the local authorities was taken by them to lighten the burden of the railway in the proposed repaving of seven blocks of King Street, which will necessitate an expenditure of approximately $25,000, of which the railway would have had to pay $11,480.

Gardner L. Boothe, president of the company, assured the Council that new rails and ties would be installed when the repaving work is started by the city. He said this would cost approximately $10,000.

Jurisdiction of Minnesota Commission Supreme

Street railway lines in Minnesota will remain under the jurisdiction of the Minnesota Railroad and Warehouse Commission. Bills introduced in both houses of the present Legislature to repeal the Brooks-Coleman act, which placed fixing of valuation, setting of reasonable rate of return on the properties and making of passenger rates, were killed in the committees, after several hearings, by means of indefinite postponements. The Senate general legislation committee acted first and the House committee took similar action March 14. The stand against the repeal of the Brooks-Coleman act was made on the theory that control of transit lines might better continue where it has rested for several years than be placed in the hands of the governing bodies of the three principal cities, Minneapolis, St. Paul and Duluth.

Public hearings on a bill to create a metropolitan zone with one rate of fare in the Twin Cities will be set. There is much opposition from Minneapolis to this bill. The cities now have the same rates, but a second fare must be paid after crossing the line from one city to the other.

◆

Parking Laws in Effect in Baltimore

After years of effort, Baltimore has put into effect a new ordinance which prohibits parking of automobiles on two of the important downtown streets. Previous efforts to pass such an ordinance always failed when the merchants claimed such action would hurt their business. A recent fire on one of the streets, during which parked automobiles hampered the firemen, aided in passage of the ordinance. The United Railways & Electric Company favored the ordinance on the ground that it would speed up service.

Under the ordinance, parking is prohibited on Lexington Street between Charles and Liberty Streets at all times; from 7:30 a.m. to 6 p.m. between Liberty and Howard Streets and between Aisquith and Caroline Streets; on Fayette Street from 7:30 a.m. to 6 p.m. between Greene and Holliday Streets and at all times between Fallsway and Broadway.

◆

Numbering Car Lines in Spokane

A system of numbering railway lines has been adopted by the Spokane United Railways, Spokane, Wash., and will be put into effect April 1, according to A. J. Schulthess, general superintendent. Under the plan each line will have a number, there being 27 lines in all. North and east lines will have odd numbers and south and west lines even numbers. The numbers are to be painted in black on white dash signs. The illuminated deck signs giving the name of the line will be retained.

Recent Bus Developments

New Lines Established by Northern Ohio

The Northern Ohio Power & Light Company through its subsidiary, the Cleveland-Akron-Canton Bus Company, established two new bus lines March 24, one through line from Cleveland to Dennison and a through line from Massillon to Dennison. The two lines converge at Dover. The Masillon line will supplant the electric line as soon as the Ohio Public Utilities Commission passes upon the application of the company for abandonment. The hearing is set for April 2.

The through service between Cleveland and Dennison will be operated on a two-hour schedule from 7 a.m. until 7 p.m. The Massillon-Dennison line will also be operated on a two-hour schedule from 5 a.m. until 11 p.m. Going north, buses leave Dennison at 5 o'clock in the morning and every hour until midnight. The bus leaving at 5 o'clock goes to Massillon. The one leaving at 6 o'clock goes to Cleveland, thus alternating during the entire period covered by the schedule.

As all of its franchises for the interurban line between Massillon and Uhrichsville have expired with the exception of one in the village of Navarre, the company expects little delay in securing an order for abandonment. When the line is discontinued, a 30-minute local service will be established between Dover and New Philadelphia. Local service will also be established between Massillon and Navarre. The company announces that additional through and local service will be supplied as rapidly as the riding demands.

The company will use Yellow coaches in this service and has purchased additional new 29-passenger White buses to take the place of the Yellows which were transferred from other lines.

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From Taunton to Middleboro

The East Taunton Street Railway has petitioned the Massachusetts Department of Public Utilities for permission to run a bus line from Taunton to Middleboro, Mass.

◆

Pennsy, B.&O. and Mitten to Supply Service

Co-ordination of all bus service in the Philadelphia district is planned by the Pennsylvania Railroad, the Baltimore & Ohio Railroad and the Philadelphia Rapid Transit Company in the interest of operating economy on routes connecting Philadelphia with New York, Baltimore and New Jersey seashore points. According to Charles W. Galloway, vice-president Baltimore & Ohio, the proposal would carry a guarantee of responsible operation, submission to fair regulation, provision for bus terminal facilities and the assurance of certain revenue not obtainable under present conditions "which could be applied to public highways." He made it plain that the railroad would insist on the provision of adequate high-speed or surface-car subway facilities to the terminal location before the actual construction was authorized.

◆

Would Prepare for Buses on Massachusetts Line

Selectmen of Wakefield, Stoneham and Winchester recently received petitions from the Eastern Massachusetts Street Railway, seeking permission to discontinue the present service by railway between Wakefield and Winchester by way of Stoneham for the purpose of substituting bus service. The petitions request the change because of the extensive plans in Winchester to widen and straighten Forest Street, through which the railway runs. It will retain the line between Arlington and Winchester.

◆

Bus Revenues Exceed Car Revenues in New Jersey

For the first time in the history of the Public Service Corporation of New Jersey bus revenue during 1928 exceeded car revenue, although the number of car passengers still substantially exceeds the number of bus passengers. Business by bus has grown from 1,952059 passengers in 1923 to 211,565,713 in 1928, while the number of trolley passengers in 1923 was 354,194,933 contrasted with 331,568,468 in 1928.

An analysis of the traffic statistics shows a decrease of 29,504,597 in the number of street car passengers and an increase of 45,485,765 in the number of bus passengers. This result is accounted for by the substitution, in many instances, of bus for car service and by bus lines taken over or put in service.

Concerning the transportation situation, President McCarter says:

> Substantial progress was made during the year in carrying forward the policy of co-ordinating transportation facilities. Our efforts are directed towards the creation of a transportation system in which street cars, buses and other units, as their operation may be undertaken, will be utilized so as to provide a maximum service and effect economy by the elimination of waste and duplicate service and the combination of construction, maintenance and operating activities to reduce overhead expense.

Regarding the initial experiment with the operation of taxicabs, the report of the company says:

> Operation of the Yellow and Public Service Cab Companies of Camden, with a combined fleet of 58 cabs, was taken over in May, and results under our management have been encouraging as to future possibilities.

Toronto Expands Its Bus Service

By securing the franchise for the Royal Blue Lines Company, Boston, Mass., for Toronto and all points within Ontario, the Toronto Transportation Commission has made a notable extension to its coverage for tourists and sightseeing parties. As the *Canadian Financial Post* points out, since the commission's subsidiary, Gray Coach Lines, has the franchise for the Gray Line, it enables the commission to furnish exclusive service in the province for the only two large sightseeing and tourist organizations in the United States.

According to D. W. Harvey, general manager Toronto Transportation Commission, operating the railway and bus system owned by the city of Toronto, the Royal Blue Lines agreement is for a period of two years, and is renewable at expiration. There is only a nominal cost attached to this extra service, but the Toronto commission will secure the advantage of the international advertising done by the Royal Blue Lines Company in all the large cities in the United States and Canada.

A number of the commission's coaches will be painted blue and carry the Royal Blue Lines insignia. The number will be small at first, and will be increased as business warrants.

These coaches bearing the insignias of the Gray Lines and the Royal Blue Lines are used for sightseeing purposes only, and are quite separate from the Gray Coach Lines' motor coaches which operate an interurban service from Toronto to points in Canada and the United States.

The Toronto Transportation Commission and its subsidiary, Gray Coach Lines, now have contact with practically every tourist agency on the North American continent.

◆

Railroads Free to Organize Bus Subsidiaries

The Interstate Commerce Commission has ruled it cannot regulate or forbid organization of bus subsidiaries by railroads, or collect excess profits from such subsidiaries. The decision apparently validiates the already extensive activity of railroads in bus operation, and permits them to expand it whenever they feel it necessary to meet competition. The decision also emphasizes the absolute freedom from regulation of interstate bus and truck operation.

A. Jaloff, doing business as "Columbia Stage," operated 40 buses between Portland, Astoria and Seaside, Ore. In 1924 the Spokane, Portland & Seattle Railroad, feeling competition, incorporated the S. P. & S. Transportation Company and installed bus service between Portland and Astoria, paralleling its tracks and also Jaloff's service.

Jaloff appealed to the I. C. C., claiming that organization of the bus subsidiary was in violation of the transportation act, which says that a railroad must, before extending its lines, get a certificate of convenience and necessity from the commission. He also claimed that the articles of incorporation of the railroad did not permit it to organize the bus line.

The commission ruled against Jaloff on both points and decided that the railroad did not have to report its earnings from the bus line under the excess profits clause of the Transportation Act. It ruled, however, that where a railroad offers through rates via a train and bus combination, it must separate the train earnings so they may be reported.

Substitution Proposed in Greenville

Recommendation that the Mississippi Power & Light Company be granted permission to substitute buses for its street cars in Greenville, Miss., was made at a meeting of the street railway committee of the City Council with E. J. Lenz, district manager of the power company. The buses would be operated on the schedule of rates submitted the City Council by L. V. Sutton, vice-president and general manager Mississippi Power & Light Company, at the meeting of the Council held on March 5. That schedule called for a 10-cent cash fare. Tokens would be sold at three for 25 cents. Weekly permits would be sold for 25 cents, and the rate of fare with the permit would be 5 cents for each ride. The proposed substitution will come before the Council for action in April.

Would Extend Line in San Diego

Application made by the San Diego Electric Railway to the city for a franchise to extend its National Avenue bus line a distance of approximately one mile has been granted. Subsequently application was made the California Railroad Commission for a certificate of convenience and necessity to cover the extended operation.

To Test Reduced Bus Fare in Boston Suburb

Public trustees of the Boston Elevated Railway will establish a 6¼-cent bus fare, for a test period, from Mattapan Square to Cleary Square and from Cleary Square to Wolcott Square, Readville, in either direction. At present the unit bus fare is 10 cents for the entire distance from Mattapan Square to Wolcott Square, but the majority of the riders use part of the service either between Mattapan Square and Cleary Square or between Cleary Square and Wolcott Square, and would save the difference in fare. The 10-cent bus fare would remain in effect for those who ride beyond Cleary Square in either direction and for those who transfer.

Receivers Sought for Indiana Company

Suit asking that a receiver be appointed for the South Side Motor Coach Company, of Indianapolis, has been filed in Superior Court by Orville P. Foreman, former attorney for the company. The bus company was sold recently to the Beech Grove Traction Company. Mr. Foreman alleges that he acted as attorney for the defendant during the sale and asks judgment for $2,500 against the company. Gilbert E. McFarland and Frank Stuck, the owners of the company, sold the property to the railway for $22,500, according to the complaint. Charges are made that the bus company is insolvent.

The suit has no connection with the new owners of the coach company property, C. F. Schmidt, president of the Beech Grove Traction Company, declared. He said the coach company still was intact as a partnership and the suit was against the partnership.

Control Bill Before New York Assembly

The New York Senate on March 22 passed and sent to the Assembly the Thayer bill, bringing under control of the Public Service Commission all stages, buses or motor vehicles operating between fixed terminals or over regular routes as common carriers.

Buses Succeed Cars on Wisconsin Line

The Wisconsin Public Service Corporation has recently abandoned interurban lines from Green Bay to Kaukauna and to Duck Creek, as well as two city lines. Service is continued with buses.

No Flat-Rate Cabs in Springfield, Mass.

Flat-rate taxicab service has been practically eliminated from the realm of possibilities as far as Springfield, Mass., is concerned. The transportation board decided on March 4 that such taxicabs "would not be for the best interests of the people or other public carriers of this city." The board was aided in its decision by reports of Worcester's recent experience with flat-rate cabs and it hesitated little in pronouncing this type of service undesirable.

The subject of flat-rate taxicabs was discussed at length at a meeting of the board on Feb. 18. Representatives of concerns seeking to enter the city and establish a business of this sort were heard, as well as officials of the local taxicab companies and President Clark V. Wood, of the Springfield Street Railway.

The board also received communications from the Central Labor Union and from the local branch of the Amalgamated Association protesting against the flat-rate service. Councilman Homer E. Barton, a member of the transportation board, sent a letter to Chairman Henry A. Booth in which he described the confusion caused by flat-rate cabs in Worcester, Mass., and voiced his strong opposition to the proposal. He said:

> The taxicab situation got out of hand at Worcester on account of the flat-rate system. They were everywhere and if they were let loose in Springfield with its limited business district a serious traffic problem would be created. I am opposed to any let-down in the present regulations.

Enthusiasm for Courteous Drivers in St. Louis

In an endeavor to reduce street accidents in St. Louis the St. Louis Public Service Company, the St. Louis Bus Company and the People's Motor Bus Company are co-operating with the Courteous Drivers Club recently formed by the St. Louis Safety Council. Motormen and bus drivers are being urged to join the club and to carry its insignia upon their vehicles. Approximately 25,000 persons have joined the club, hundreds of them residing outside of St. Louis. In fact members are from sixteen states, having become interested in the movement through speeches broadcast by Colonel Courtesy from Radio Station KMOX, the "Voice of St. Louis." The two slogans of the club are: "Be Courteous and Save A Life" and "Drive Safe and Stay Alive." The code of driving promulgated by the club covers twelve rules.

Safety Work Continues on Ohio Lines

Chairmen of departmental safety committees of the Indiana, Columbus & Eastern Traction Company and the Dayton & Columbus Transportation Company were elected at the semi-annual meeting of the committees held in Springfield, Ohio, on March 15. The organization has been functioning five years, and during this period the employees of various departments have submitted 369 safety suggestions, 279 of which have been definitely acted upon. Ten inspections of the entire property have been made during this period. Since the safety organization has been in existence, railway cars have operated on an average of 20,835 miles per traffic accident, and the buses 18,500 miles per traffic accident.

Bus Service Started to Plant of American Chatillon Corporation

The Rome Coach Company, Rome, Ga., a recently organized subsidiary of the Georgia Power Company, has started a service of buses for workers and visitors to and from the plant of the American Chatillon Corporation. This service is operated in co-ordination with the railway system under the direction of T. S. Sloan, division manager.

Financial and Corporate

Tacoma-Seattle Line Sale Continued

Action on the confirmation of the sale of the Puget Sound Electric Railway's Tacoma-Seattle interurban line has been continued for ten days by Judge J. Stanley Webster in federal court, on request of Scott Z. Henderson, receiver for the interurban, who asked a stay until Judge E. E. Cushman returned to the city. A possibility exists for a new call for bids. The court is now considering four bids, as follows: Louis Rosenthal, San Francisco, $360,000, for the entire interurban property; The Puget Sound Electric Company, Seattle, $348,208 for the right-of-way and operating property; Perry, Buxton, Doane Company, Boston, $251,873 for the entire property, and $191,878 for the operating property alone; the Hofius Steel & Equipment Company and the Hyman Micheals Company, $178,250 for the operating property.

Cessation of Massillon Service

The Northern Ohio Power & Light Company will abandon its Massillon street car system on April 26 and discontinue all service. The rails are to be taken up and streets placed in repair. The Massillon system was built more than 25 years ago. Some two years ago the City Council granted The Fidelity Transportation Company the right to operate buses over streets adjacent to the car lines. Since that time the railway has been endeavoring to discontinue service. Its franchise does not expire until 1932.

The railway has had a fare of 8 cents cash, with four tickets for 25 cents. The bus company is to receive a 10-cent flat fare. Permission to remove the lines was granted by the City Council on March 25. The property of the Massillon Street Railway System is valued at approximately $600,000. Abandonment of the Massillon line fits in with the general plan to remove the interurban from Massillon south to Uhrichsville, referred to elsewhere in this issue.

Atlantic City & Suburban Road to Liquidate

Unable to meet expenses for several years the Atlantic City & Suburban Railway, which has been operating between Atlantic City, Absecon and Somers Point, N. J., since 1902, will abandon the service, remove its tracks and sell its equipment. P. R. Goldy, receiver for the company, denied that the company was planning a bus service. Real estate holdings and equipment will be sold as speedily as possible and the receipts applied to claims of creditors. This road is paralleled throughout practically its entire length by the fast electric line of the Atlantic City & Shore Railroad.

Eastern Massachusetts Net Up

Returns for 1928 show an improvement of $220,729—situation reviewed—public control extended

Stockholders of the Eastern Massachusetts Street Railway, Boston, Mass., held their annual meeting on March 4. In the management of the road they have no other power now, under public control, than to elect a board of directors which can act merely in an advisory capacity, and keep the organization intact until the property is returned to them. At this year's annual meeting they made no change in the directorate, voting unanimously for the old board. The board will meet later to elect its own chairman.

Since the issuance of the last annual report of the public trustees, the Massachusetts Legislature has enacted a new public control act extending public control for five years more. In certain respects the present act differs from chapter 188, acts of 1918. The chief difference between the two acts is in the constitution of the respective boards of trustees. The present act provides for a board of five trustees to be appointed by the Governor, with the advice and consent of the council. The new act provides for a board of three trustees, two to be appointed by the Governor, with the advice and consent of the council, and one to be "a representative appointed by the board o directors of the company from thei own number." This gives the stockholders, through the board of director elected by them, a direct representatio on the board of trustees. The new ac continues the power of the trustees t fix and regulate rates and fares and t determine the character and extent o the service and the facilities to be furnished, and a similar authority to fi such rates and fares as in their judgment will produce sufficient income t meet the cost of the service, whic includes all fixed charges and dividends

The new act eliminates various provisions about the taking over of th property and franchises of the Ba State Company, which are no longe pertinent, and provisions about th initial capitalization, which was set u by the old act. It also eliminates certain provisions as to the issue of seria bonds not exceeding $4,000,000, as t which if the earnings of the compan were not sufficient to pay instalment of such bonds as they matured, th trustees could call upon the treasure and receiver general of the Commonwealth to purchase them and assess th cost upon the cities and towns in whic the company operates. The new ac also eliminates provisions about a reserve fund of $500,000. Under it th powers of the directors are increased i respect to contracts for the acquisitio or abandonment of lines. This is made t apply to bus lines as well as street railway lines, any such contract requiring the consent of the directors.

The annual report, which came from the Board of Public Trustees, was presented by the chairman of the trustees, Arthur G. Wadleigh. I showed income of $9,248,119 for the year 1928, compared with $9,625,434 in 1927, a decrease of $377,315. Revenue from bus operation, however,

COMBINED INCOME STATEMENT OF EASTERN MASSACHUSETTS STREET RAILWAY FOR ALL DISTRICTS

	1928	1927	Increase or Decrease
Street car revenue	$8,090,020	$8,472,602	*$382,582*
Auto bus revenue	431,357	381,375	49,982
Express and other revenue	31,042	36,773	*5,731*
Rentals, advertising, etc.	188,882	190,171	*1,289*
From sale of power	264,457	262,275	2,182
Interest and other income	242,361	282,238	*39,877*
Total revenue	$9,248,119	$9,625,434	$377,315
Expenses:			
Way and structures	$1,055,021	$1,221,227	*$166,206*
Equipment	882,453	1,240,498	*358,045*
Power	1,215,992	1,270,720	*54,728*
Car operation	2,194,210	2,249,449	*55,239*
Injuries and damages	234,469	252,050	*17,581*
Insurance	75,592	73,003	2,589
Law expenses	18,708	15,217	3,491
Rent of tracks	80,622	82,382	*1,760*
General wages and expenses	246,595	241,583	5,012
Pensions	23,644	22,242	1,402
Group insurance	73,394	69,314	4,080
Stationery and printing	32,854	33,917	*1,063*
Stores and garage expenses	60,516	56,652	3,864
Miscellaneous expenses	47,083	45,307	1,776
Auto bus expenses	441,193	399,221	41,972
Survey and study of property	32,058	....	32,058
Total operating expenses	$6,714,404	$7,272,782	*$558,378*
Total operating expenses and taxes	$7,079,163	$7,631,676	*$552,513*
Gross income	2,168,956	1,993,758	175,198
Interest and rentals	1,176,167	1,221,698	*45,531*
Net income	$992,789	$772,060	$220,729

Note—*Italics* denote decrease.

which is included in the figures quoted, showed an increase from $381,375 for 1927 to $431,357 for 1928. There were losses during the year in railway revenue, express service, rentals and interest on income. The only items that showed gain were the auto buses and the sale of power, the latter item showing an increase from $262,275 in 1927 to $264,457 in 1928.

Expenses were reduced. They amounted to $6,714,404 in 1928 for purely operating functions, as against $7,272,782 in 1927. The items which cost less in 1928 than in 1927 were way and structures, equipment, power, car operation, injuries and damages, rent of track, and stationery and printing. The items that cost more in 1928 then in 1927 were insurance, law, general wages, pension, group insurance, storage and garage, auto bus expenses, survey and study of property.

Computing taxes and other fixed charges it is found that the net income for the year was $992,789. This is $220,729 more than the net income in 1927. The increase in the net income is due to savings.

Operating expenses include charges for depreciation amounting to $824,007 in 1928 and $848,467 in 1927. During the year 1928 $1,169,090 of the depreciation reserve was applied to reconstruction and amortization.

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Change on P.R.T. Board

At the annual stockholders' meeting of the Philadelphia Rapid Transit Company, Philadelphia, Pa., N. H. Pettitt was elected a director to succeed L. W. Hackett. He is chairman of the Committee of Employes Co-operative Association.

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Change in Denver Directorate

Stockholders of the Denver Tramway, Denver, Col., at their annual meeting accepted the resignation of J. C. Bullock, Providence, R. I., as a member of the board of directors. In his place they elected F. E. Kingston, Hartford, Conn. W. A. Doty, secretary, also was elected to the board and was given the additional office of treasurer, succeeding the late H. J. Alexander, of Denver.

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$251,824 Available in San Diego

The San Diego Electric Railway, San Diego, Cal., reports to the Railroad Commission its 1928 operating revenue at $1,659,767, compared with $1,676,501 for 1927. Operating expenses, excluding taxes for 1928, are $1,384,800 and $1,381,324 for 1927, leaving a net operating revenue of $274,967 for 1928 and $295,176 for 1927. During 1928 taxes charged to operation amounted to $120,086, and for 1927 to $124,387. Deducting the taxes leaves operating income of $154,880 for 1928, and $170,789 for 1927. Adding the non-operating income of the company to the operating income, and deducting non-collectible revenue and rents, results in a gross corporate income of $251,824 for 1928, compared with $263,055 for 1927.

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Substantial Improvement Shown by Iowa Interurban

Net earnings of the Waterloo, Cedar Falls & Northern Railway, Waterloo, Ia., for 1928, after operating expenses and taxes, were more than 90 per cent greater than that of 1927, and 620 per cent in excess of those of 1925, being the largest net result since 1917. Net income for 1928—$203,734—is equal to 3½ per cent on the first mortgage bonds. All this money has gone back into the property in renewals and extensions, thereby enabling it to handle with efficiency the steadily increasing business.

A condensed comparative statement of operations for the past four years follows:

Comparative Statement of Earnings at Waterloo, Cedar Falls & Northern Railway

	1928	1927	1926	1925
Gross earnings	$1,123,437	$980,910	$914,698	$827,353
Operating expenses	882,682	834,009	755,084	750,899
Net revenue	$240,755	$146,901	$159,613	$76,454
Taxes	37,021	39,881	44,064	48,166
Net operating income	$203,734	$107,020	$115,550	$28,288

The gross revenues for 1928 show an increase of $142,528; freight and switching revenues increased $156,785; passenger revenues fell off $20,471; miscellaneous earnings, including sale of power, increased approximately $7,000. The loss in passenger revenue is all chargeable to interurban lines, as earnings on motor coach and city lines increased $18,425. The loss in interurban passenger revenue is ascribed entirely to improved highways and the great increase in the number of privately-owned automobiles.

Operating and maintenance expenses increased $48,674, due to extra cost of handling a larger freight business, and more money expended in the maintenance of the property. C. M. Cheney, in his report to the protective committee, says that whatever prosperity the company might reasonably expect to enjoy must necessarily come from increased freight traffic, and every effort possible has been put forth to this end during the past five years.

With rather a thin population, improved highways practically paralleling the company's interurban lines, and the ever increasing number of privately-owned automobiles, Mr. Cheney feels there is little possibility of maintaining passenger levels.

With industrial conditions at a low ebb during the years 1923, 1924, and 1925, freight traffic continued to show some increase over the preceding years, and since 1925 there has been a decided gain each year: $87,596 in 1926; $101,504 in 1927, and $156,785 in 1928.

To liquidate overdue taxes, pay off floating indebtedness, properly maintain the property, construct new tracks and purchase additional equipment made necessary by heavier freight business, it has been necessary each year to use the net revenues. That this course has been fully justified is best evidenced by improvement in the physical condition and earning power of the property.

During the year 1928 the John Deere Tractor Company decided to spend $5,000,000 for the purpose of expanding its Waterloo plant. The interurban was fortunate in being able to grasp the opportunity to serve this plant exclusively. It was necessary, however, in order to do this to spend $135,000 to cover the purchase of additional real estate, freight equipment and the construction of 1½ miles of new trackage. Mr. Cheney estimates the company will enjoy an increased freight revenue of from $200,000 to $250,000 per annum from this plant. Gross revenues earned on business from the John Deere Tractor Company during 1927 were $111,983; during 1928, $238,409.

E. V. Kane, chairman of the committee representing the holders of the first mortgage bonds, in a recent statement says:

> The results of the operation for the calendar year 1928 further justify the waiting policy of the protective committee. Nursed through the trying period ending with 1925, and maintained in an excellent state of efficiency, the property was in the best of condition to handle the increased traffic when the tide of prosperity turned in 1926. The full meaning of this is best shown in figures. Gross earnings for 1928 were the largest in the company's history, showing a gain over 1927 of more than 14 per cent, and of more than 35 per cent over those of 1925. The increase was entirely from freight. Passenger traffic, owing to automobile competition, continues to show a loss.

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Service in Santa Barbara To Be Discontinued

Finding that it is impossible to fix a rate structure that will produce an adequate revenue to permit the operation of the Santa Barbara & Suburban Railway, the Railroad Commission has authorized that company to discontinue operation as a common carrier in the city of Santa Barbara, Cal., upon 30 days' notice to the public.

On Jan. 16, 1928, the State Railroad Commission authorized the company to increase its rates and to make certain alterations in its service with that end in view. The revenues of the utility under these rates having proved inadequate, the commission found no alternative but to grant the request of the company for permission to abandon operation.

Legal Notes

ALABAMA—*Use of Streets. Company Responsible for All Injuries Resulting from Negligent Act.*

A street railway has no paramount right to the use of the streets occupied by its tracks as against other vehicles or pedestrians. Where a car strikes an automobile and drives it against a prospective passenger, the company was responsible, even if it was difficult to foresee the precise injury which would be occasioned by the negligent act. A motorman may assume that a vehicle on the track, or in dangerous proximity, would turn aside to avoid collision, when the danger of collision becomes imminent. [Alabama Power Company vs. Bass, 119 S., 625.]

CALIFORNIA — *Adequate Crossing Protection.*

It cannot be said, as a matter of law, that a "Railroad Crossing" sign, located within a few feet of the rails and partly behind a telephone or telegraph pole, was of any significance in affording protection to users of the highway. [Baldwin et al. vs. Pacific Electric Railway, 274 P., 72.]

NEW JERSEY—*Power of Commission to Co-ordinate Fares.*

Where a street railway and associated bus company request the Board of Public Utility Commissioners to coordinate the fare zones of the two companies in the same territory, the board has power to do so without a valuation of the used and useful property of one of the companies. [Borough of Roselle Park vs. Board of Public Utility Commissioners, 144 A., 623.]

NEW YORK—*Public Service Commission Without Jurisdiction to Issue a Certificate of Convenience and Necessity to Bus Operator Without City's Consent.*

On Dec. 11, 1925, Elliott B. Seagraves filed with the City Council of Long Beach an application for the consent of the city to the operation of a bus line. On Dec. 17, 1925, a special meeting of the Council was held, at which all the members of the Council, including the Mayor, were present. A resolution was adopted by a vote of four to one whereby the consent of the Common Council was given to the operation of the proposed bus route, the Mayor voting "no" and the others voting "aye." On Dec. 18, 1925, Seagraves assigned the consent to the Long Beach Bus Company. On Dec. 21, 1925, the Long Beach Bus Company, Inc., filed with the Public Service Commission its petition for a certificate of convenience and necessity. On Jan. 2, 1926, the City Council again met. Four of the Councilmen, having failed of election in the preceding month of November, had gone out of office and four other men had been elected to take their places. The Mayor of the city, who had been continued in office, announced his veto of the resolution previously adopted on Dec. 17, 1925, whereby consent had apparently been granted to Elliott B. Seagraves. His written veto of the prior resolution was filed with the Common Council. Thereupon the Council adopted a resolution unanimously rescinding the apparent consent given to Seagraves. It was after this meeting, in March, 1926, that the certificate of public convenience and necessity was granted by the Public Service Commission. The court ruled that the period for the exercise of the veto power had not been exhausted and that the veto filed on Jan. 2, 1926, was effective to nullify the resolution of consent. [Long Beach vs. the Public Service Commission, 164 N.E. 553.]

NEW YORK—*Use of Crossings.*

Under the Greater New York Charter, the City Police Commissioner is authorized to make rules regulating traffic and a section provided that pedestrians, where no police officer is present and no traffic light control system is in operation, shall have right-of-way on crossings, and that vehicles must slow down and stop if necessary to permit pedestrians to pass. This section was held valid, although it caused a change in the common law rule giving pedestrians and vehicles equal right on streets and highways. [Castro vs. New York Railways Corporation et al., 231 N. Y. Supp., 649.]

RHODE ISLAND—*Motormen Must See That the Overhang of Their Cars on Curves Does Not Strike Standing Automobiles.*

While travelers on the street are generally required to keep a sufficient distance from a trolley car which is in motion and changing direction on a curve to avoid the overhang of the car, the driver of an automobile, stopping for traffic alongside a trolley car, is not bound as a matter of law to move his automobile and make sufficient clearance for the overhang of the car when it is turning a corner. [Forbes vs. United Electric Railways, 144 A., 154.]

WEST VIRGINIA—*Liability for Damage by Power Plant.*

Where a public service corporation properly constructs and operates its generating plant on its own land and its operation causes a dwelling house on land nearby to vibrate to such an extent as to destroy it as a dwelling house, right of action by the owner of the dwelling may be maintained at any time within the period of limitation against such corporation; but a corporation which purchases the plant after the injury and right of action has accrued, and which properly maintain and operates the plant, is not liable fo such permanent injury. [Byrne vs Monongahela West Penn Public Ser vice, 146 S. E. 522.]

Book Review

Practical Railway Painting and Lacquering

By H. Hengeveld, master painter Atlantic Coast Line Railroad, C. P. Disney, bridge engineer Canadian National Railway, and William J. Miskella, director Finishing Research Laboratories, Inc. Published by the Finishing Research Laboratories, Inc. Chicago, Ill. Distributed by Simmons-Boardman Publishing Company, New York N. Y. 267 pages; 154 illustrations; price $3.50.

Much of value to electric railway paint foremen will be found in the new book "Practical Railway Painting and Lacquering." Although this treats particularly of steam railroad practice, the problems are quite similar to those encountered by electric railways. This is Volume IV of a series of books on practical finishing. It is divided into five parts. The first contains general information. The second deals with the painting and lacquering of locomotives, freight and passenger cars. The third treats of the painting of signal equipment. The fourth gives information on the painting of bridges, buildings and water service, and the fifth describes practices in the lacquering of electric railway cars. The authors evidently have had considerable experience in the use of spray equipment as the book contains much information on equipment, paints, and troubles that are encountered in spray painting.

The first part gives much information on spraying equipment, accessories, sandpapers and waterproof-coated abrasives, lacquers and other paint materials, housekeeping hazards, sand blasting equipment and its operation, the lacquer and spray gun troubles and remedies, portable cleaning equipment, modern testing methods, scaffolding and ornamentation. In the second part, dealing with painting and lacquering, a large portion is devoted to passenger car painting. This describes late coach painting equipment, spraying outfits, and special exhausting arrangements. A chapter is also devoted to the painting of buses, and gives information on the size of paint shop required and the layout of a modern spray room.

The section on bridge and building painting contains material by Mr. Disney, who is bridge engineer for the Canadian National Railways, and who has had much experience in this class of work. The part on lacquering of electric railway cars is not very complete. It treats of the change which is going forward in connection with electric railway car painting, gives some comparative specifications of paint for electric railway cars, and describes the spray painting installation of the Cincinnati Street Railway.

Personal Items

Messrs. Snyder, Pettit and Studebaker Honored

Announcement is made from the executive offices of The North American Light & Power Company of the appointment of D. W. Snyder, Jr., as president of the Missouri Power & Light Company, with headquarters in Kansas City.

Mr. Snyder was formerly vice-president of the Illinois Terminal Railroad System with headquarters in Springfield, Ill.; prior to that he had been general manager of the utility properties of Illinois Power & Light Corporation at Bloomington, Ill.; Jefferson City, Mo.; and Clinton, Ill. He is a graduate of LaFayette College. His first business connection was as selling engineer for the Westinghouse Company.

L. A. Pettit, Jr., formerly vice-president of the Missouri Power & Light Company, has been appointed vice-president in charge of operation of the United Power & Light Corporation, an operating company serving the principal cities in central Kansas.

Clement Studebaker, Jr., has been elected president of the United Power & Light Corporation and A. M. Patten has been elected executive vice-president of the same company.

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New Duties for H. G. Tulley of Philadelphia

H. G. Tulley was elected vice-president in charge of industrial relations of the Philadelphia Rapid Transit Company, Philadelphia, Pa., at the recent organization meeting of the board. This s a newly-created office. Mr. Tulley resigned as president of the International Railway, Buffalo, on Jan. 1, 1926, o become vice-president of Mitten Management, Inc., Philadelphia. Later in that year he was elected president of the Yellow Cab Company, which had been taken over by the Philadelphia Rapid Transit Company.

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Sam Harris Leaves Pittsburgh Railways

After seventeen years' service with he Pittsburgh Railways, Pittsburgh, Pa., Sam Harris has resigned as special ar agent. He is now associated with is three brothers, who operate a chain t Harris Stores. Sam Harris himself will conduct the store at Canonsburg.

Mr. Harris moved from New York o Pittsburgh in 1911, at the age of eventeen, and secured employment with e railway as checker. A few years later he was made secretary to the company's traffic agent, and in 1922 was ppointed to the position of special car gent of the Pittsburgh Railways in which capacity he was unusually successful. During the past year, for example, he furnished approximately 3,000 special street cars to picnics, field meets, etc., in the Pittsburgh district.

The Tracto Club of the railway held a farewell dinner March 15 in the Fort Pitt Hotel in honor of Mr. Harris. As an expression of the high regard held for Mr. Harris by the employees of the railway, the club presented him a beautiful Gladstone traveling bag.

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L. M. Brown Heads C.E.R.A.

Lemuel M. Brown, vice-president in charge of railway operation of the Interstate Public Service Company, Indianapolis, Ind., was recently elected president of the Central Electric Railway Association.

In 1905 Mr. Brown entered the electric railway field, beginning as a conductor on the Indianapolis, Columbus & Southern Traction Company, which later became a part of the Interstate Public Service Company. At that time Mr. Brown was associated with Joseph I. Irwin, one of the pioneers of the electric railway in Indiana. Shortly after entering the employment of Mr. Irwin, he became train dispatcher and in 1908 he was appointed train master at Indianapolis. This position he held for ten years. In 1912 the Interstate Public Service Company, at the time of its formation, took over the property of the Indianapolis, Columbus & Southern Traction Company as part of the proposed railroad system to Louisville, Ky. Mr. Brown continued in the employ of the Interstate and in 1918 was appointed superintendent of transportation. Four years later he was elected general superintendent of all the railroad property of the company.

L. M. Brown

At the annual meeting of the Interstate in March, 1927, Mr. Brown was made vice-president in charge of railway operation and in January, 1928, the Winona Railway made him vice-president in addition to his Interstate duties.

Mr. Brown was born in Jackson County, Ind., in 1883. His early training in the district schools was followed by a course at the Central Normal College at Danville, Ind., and later at Indiana University at Bloomington. Upon the completion of his college work, he taught school.

OBITUARY

Charles L. Kurtz

CHARLES L. KURTZ, former president of the Columbus Railway, Power & Light Company, Columbus, Ohio, died at his home in that city on March 24. Mr. Kurtz returned recently from Mexico, seriously ill after a month's business trip.

When in January, 1925, Mr. Kurtz stepped down as president of the Columbus Railway, Power & Light Company he ended a period in his career which will go down in railway history as one of the outstanding examples of generalship in the field of public utilities.

In January, 1919, Mr. Kurtz assumed that office. At that time the company was without credit, its bond interest was in default and dividends on stock had been suspended. Back wages, ordered to be paid during the war, presented another obstacle, and a suit had been instituted for receivership, an accounting and a judgment against the company.

The first thing Mr. Kurtz did when he assumed charge in Columbus in 1919 was to institute a program of the most rigid economy. Waste was eliminated. At the same time he worked to build up the morale and restore co-operation as the touchstone of success. But he knew that while economy was necessary, there alone was not the key to the restoration of the property to earning powers. During the period that the company was under the direction of Mr. Kurtz more than $13,000,000 was spent for construction and rehabilitation. Not only that, but he got from the Council an increase in fare to five tickets for 25 cents, a 6-cent cash fare, with a universal transfer free of charge. Furthermore, Mr. Kurtz succeeded in placing a $3,000,000 loan to pay floating debts. Subsequently he liquidated this loan.

These are merely some of the outstanding achievements of the company during the presidency of Mr. Kurtz. All of them were accomplished through his influence, skillfulness, level-headedness, perseverance, and last but not least, hard work. True, Mr. Kurtz was not a utility man in the strict sense of the word, but the rehabilitation work that he did at Columbus is an epic of its kind in the annals of the industry.

Between the time he started as a newsboy to the time he finished as a financier, Mr. Kurtz had been a bookseller, newsstand keeper, state legislator, private secretary to an Ohio Governor, a power in the Republican party and an inspector of oils for the state of Ohio. When he died he was president of several enterprises. He was 74 years old.

Improvement Projects Announced

New York State Railways plans expenditures of approximately $736,228. Northern State Power Company to improve its system. Other construction planned. Illinois Central Railroad orders four electric locomotives. Lehigh electrification indicated

NEW YORK STATE RAILWAYS, Rochester, N. Y., plans to expend approximately $736,228 for paving and remodeling of equipment on its systems in Rochester, Syracuse and Utica. The total operating expenses for this system are estimated at $6,805,565. The budget of the Rochester line provides for an expenditure of $156,000 for fifteen new buses and $2,600 for remodeling two buses. The purchase of these buses will provide for an extension of service in Rochester.

This company also plans the reconstruction of 45 cars for one-man operation at a cost of $36,000. These cars will be used to effect economies on unprofitable lines and as a means of giving more frequent service with a lower cost of operation. The company will also spend about $175,000 this year for street repairs and construction. The operating expenses for Rochester alone are estimated at $3,635,515.

Other Projects Planned

Improvements of the street railway system of the Northern State Power Company at Eau Claire, Wis., will represent an expenditure of approximately $82,000 this year. These improvements include replacement of several blocks of track with new and heavier rail and the addition of two new cars of the double-truck type.

The Petaluma & Santa Rosa Railroad, Petaluma, Cal., has applied to the railroad commission for authority to remodel a portion of its passenger equipment to operate this equipment on its Forestville branch. It is proposed to operate cars of the one-man type equipped with safety doors and control.

Repaving work on Main Street, Memphis, Tenn., by the Memphis Street Railway will begin in the near future. This company has agreed to renew its track from Linden Avenue to Poplar and to repave the street lying between the tracks and a strip 2 ft. wide on each side of the outside rail. It is estimated that the cost of this improvement will amount to $72,000.

Four Locomotives for Chicago

The Illinois Central Railroad, Chicago, Ill., has ordered four electric locomotives for handling freight in the Chicago terminal division. The purchase represents the first step in fulfilling the city's lake front ordinance, which requires the electrification of the railroad's freight service north of Twelfth Street by February, 1930, and south of there to the city limits by February, 1935.

The new locomotives will be built by the Westinghouse Electric & Manufacturing Company, the first being scheduled for delivery early in October and the others by the end of the year. Of identical design, they will weigh 100 tons each and develop 1,200 hp. under normal conditions with an additional 250-hp. reserve rating. Power will be supplied from an overhead system.

During the initial phase of electrifying the freight service, locomotives will operate between 39th Street and Monroe Street. The installation of power distribution facilities in this zone is well along toward completion. Transfers between steam electric locomotives will be made on tracks already constructed near 31st Street.

Between Monroe Street and the terminal yard on the south bank of the Chicago River in the Loop district, conditions are unfavorable for overhead power construction, necessitating the use of some self-contained motive power equipment. Another difficulty is that the permanent location of many of these tracks is uncertain by reason of the possibility of extensive changes in connection with development of air rights.

To meet with this situation, the Illinois Central has placed in service a 100-ton oil electric locomotive of 600-hp. capacity built by Ingersoll-Rand, General Electric and American Locomotive Companies. The generator is driven by two Diesel engines. On June 1 an all-electric locomotive powered by storage batteries will be borrowed from the Commonwealth Edison Company and tested in comparison with the oil-electric unit. Results of this test will guide the railroad in making further purchases of electric locomotives of the self-contained type.

$250,000 Construction in British Columbia

The contract for construction of a new route for the Stave Falls line of the British Columbia Electric Railway, Vancouver, B. C., has been awarded to Ellis-Cotton, Ltd., Vancouver, B. C., at a cost of $134,736. This construction entails the raising of the line for 3½ miles of its length above the level of the lake, which is now being formed by the erection of a dam in connection with the power project of the railway at Ruskin, B. C. In addition to this contract ¾ mile of new railway line will be laid by the general contractor on the Ruskin power plant project. The total length of the new line when completed will be 6 miles.

Relocation of this line calls for the removal of 170,000 yd. of earth. 17,000 yd. of rock will be taken out and 40 acres of clearing is necessary. There will be 2,000 lin.ft. of trestle work and 1,800 lin.ft. of culverts.

In addition to the cost of relocation, the electrification of the line will be carried out by the crews of the British Columbia Electric Railway, bringing the total cost of the construction up to approximately $250,000. This line is a passenger and freight railway which operates from the town surrounding the Stave Falls power plants and connects with the main line of the Canadian Pacific Railway. The line is entirely electrically-operated and was built originally by the Western Power Company of Canada at a cost of $250,000. All work is to be completed by Sept. 15 of this year.

The Rockford Electric Company, Rockford, Ill., will soon extend its East State Street line four blocks from the present terminus at Hunter Avenue. A wye at the end of the line will be installed to permit operation of its larger types of cars on this route.

Lehigh Valley Electrification

Surveys are being made for the electrification of the Lehigh Valley Railroad between Mauch Chunk and Wilkes-Barre, Pa. It is said that estimates of the cost of the project are being made by the Westinghouse Electric & Manufacturing Company, the General Electric Company and the American Brown Boveri Electric Corporation. It is indicated that the cost of electrifying this 75 miles of double track will reach $7,000,000.

The Seattle Municipal Railway, Seattle, Wash., has awarded a contract for furnishing 300 33-in. rolled-steel car wheels to the Edgewater Steel Company, Seattle. The Seattle Municipal Belt Line will accept the seven used cars, recently ordered, on terms dictated by the city. The sellers have accepted the conditions and the cars will be placed in the shops of the railway for an overhaul of their electrical equipment. It is estimated that $5,752 will be spent reconditioning the bodies.

Equipment and Material Ordered

Equipment recently ordered by the Beach Grove Traction Co., Indianapolis, Ind., includes seven Reo 21-passenger buses. The Berlin Street Railway, Berlin, N. H., plans to rebuild 2,100 ft. of track and road bed. This company has recently ordered three cars of ties, six kegs of spikes, 500 ft. of guy wire, 3,600 lb. of trolley wire, 100 insulators, four overhead frogs, and 100 trolley wheels.

The Portland Electric Power Company, Portland, Ore., is having plans drawn for a two-story equipment storage and distributing plant with repair department, to cost $40,000 with equipment.

Bids for the installation of express track on the Broad Street subway, Philadelphia, Pa., have been made. This subway is now operating on two tracks from the City Hall to the Fern Rock terminal. Express service calls for two additional tracks which will also utilize the Fairmont Avenue station now nearing completion.

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Johns-Manville Elects Officers

At a meeting of the board of directors of the Johns-Manville Corporation held March 15, William R. Seigle, formerly vice-president in charge of mines and factories, was elected chairman of the board of directors, and Lewis H. Brown, formerly secretary and assistant to the president, was elected president. Mr. Seigle succeeds H. E. Manville, resigned, and Mr. Brown succceeds Theodore F. Merseles, who died March 6. Mr. Seigle has been in the service of Johns-Manville since his graduation from college in 1900, at which time the corporation was known as the H. W. Johns Manufacturing Company. Under Mr. Seigle's leadership the mines and factories making up the manufacturing units of Johns-Manville have been greatly enlarged and improved by the introduction of labor- and time-saving devices.

Mr. Brown engaged in sales work early in his career for a manufacturing company in Indiana. Immediately after the war he joined Montgomery Ward & Company. From 1921 to 1927 Mr. Brown was in close personal contact with the late Theodore F. Merseles, then president, and George B. Everitt, now president of Montgomery Ward & Company, during the remarkable years of the reorganization and revitalizing of Montgomery Ward.

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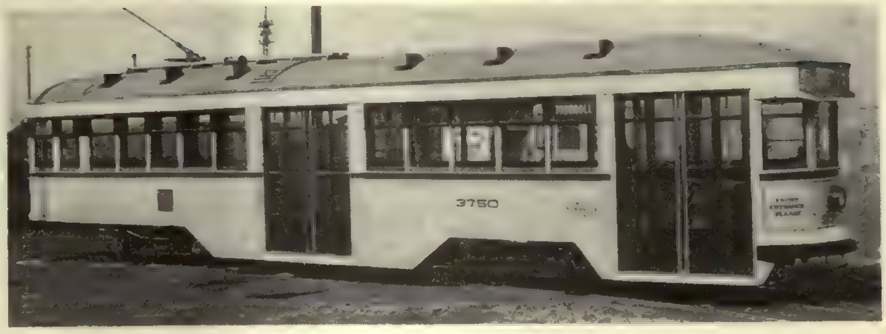
Servicised Products and Carey Company End Differences

The Servicised Products Corporation, Chicago, Ill., and The Philip Carey Manufacturing Company, Lockland, Ohio, announce that they have terminated their differences including the pending litigation. The Servicised Products Corporation was granted and is now manufacturing premoulded products under a license on patents owned by The Philip Carey Manufacturing Company, including, in addition to patents formerly owned by that company, all patents heretofore owned by the Servicised Laboratories, Inc., relating to premoulded products, such as expansion joint, rail filler, track pavement, railroad crossings construction materials and other like products. It is stated, however, that otherwise the two companies are entirely distinct and independent corporations.

Detroit Car Delivery Starts



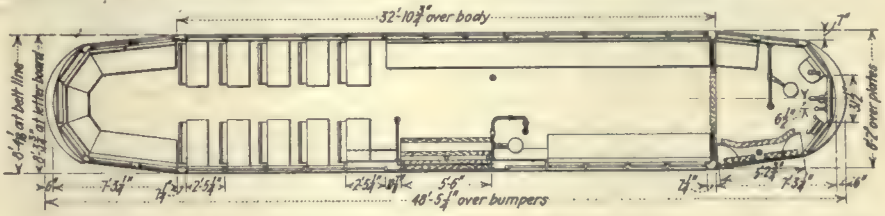
One of the Peter Witt type cars being delivered to the Department of Street Railways, Detroit, Mich.

The first of 100 new passenger cars was recently delivered to the Department of Street Railways, Detroit, Mich., by the Perley A. Thomas Car Company, High Point, N. C. These cars are of the Peter Witt type and are being built to practically the same specifications as the 500 of this type now in operation on the lines of the Detroit Street Railway. The new cars are of the city, single-end, double-truck type, each seating 52 passengers. They are 48 ft. 5 in. long and have a maximum width of 8 ft. 4 in., being of the front-entrance, center-exit type. The two center-exit doors are of the sliding type with stationary steps and the two front-entrance doors are of the two-leaf folding type, arranged to swing inward, with stationary steps.

The interior trim of the Detroit cars is in natural cherry. The leather upholstered seats are equipped with horizontal grab-handles

All doors are pneumatically-operated, the center doors being selective controlled by the conductor and interlocked with the car circuit so that the car cannot be moved while the doors remain open. No signal light is used. All seats will be fully upholstered in genuine leather and will have deep spring cushions and offset horizontal grab-handles of wood. When completed each car will carry the underwriter's label, thus enabling the Department of Street Railways to secure a low fire insurance rating under its 100 per cent blanket fire insurance coverage.

The trucks have a 5-ft. 6-in. wheelbase and are spaced 23 ft. 9 in. on the bolster centers. Each truck is equipped with two 35-hp. inside-hung motors and 26-in. rolled-steel wheels. Half of the motors will be furnished by the General Electric Company and half by the Westinghouse Electric & Manufacturing Company. A survey is now being made to ascertain if the system needs 100 cars in addition to the present order.



Floor plan of one of the 100 cars being built by the Perley A. Thomas Car Company

Car body	17,130 lbs.
Trucks per pair	11,000 lbs.
Motor and control equipment	6,620 lbs.
Air brake equipment	1,250 lb.
Total	36,000 lbs.
Length over bumpers	48 ft. 5 in.
Truck center distance	23 ft. 9 in.
Truck wheelbase	5 ft. 6 in.
Height Rail to step	15 in.
Width of seat	35 in.
Width of aisle	23 in.
Axle bearing diameter	4 in.
Wheel diameter	26 in.
Height, rail to trolley base	10 ft. 9¾ in.
Air brake type	Westinghouse
Body	Semi-steel
Car signal system	Faraday high voltage
Compressors	Westinghouse DH-16 and GE CP-27
Control	K-35-HH
Destination signs	Hunter
Doors	Center-sliding, end-folding
Door mechanism	National Pneumatic
Hand brakes	Peacock Staffless
Heaters	Consolidated 1522-T or Gold 478
Headlight	Electric Service Supply Company, Type RRX-96
Headlining	Agasote
Interior trim	Natural cherry
Journel bearings	Plain
Lamp fixtures	Electric Service Supply Company 22010
Motors	Four—35-hp. 600-volt interpole, ventilated box frame inside-hung, General Electric 265-A and Westinghouse A-510
Painting scheme	Ivory with green trim
Roof	Arch
Sash fixtures	Curtain Supply Company
Seats	Heywood-Wakefield 8-M-5 Special
Seating material	Brown leather
Step treads	Kass type 14
Trolley base	Ohio Brass Form 1
Trolley catcher	Ohio Brass 13141
Truck type	Standard
Ventilators	Railway Utility, honeycomb
Wheels	26-in.-rolled-steel

Russian Railway to Be Electrified

Electrification of the 63 km. (40 miles) of the Sestafoni-Chashuri section of the Baku-Batum Railway, of Russia, in which is located the Souram Pass, is now under consideration. The oil traffic is expanding at such a rate that even the doubling of the old Baku-Batum pipeline is insufficient to cope with the increasing trade. Moreover, the completion of the Maritime line from Batum northwards along the Black Sea coast has put an additional strain on the one track of the Baku-Batum line which now serves as one of the feeders of the Maritime Railway. The authorities are therefore forced either to double the track or electrify the "bottle-neck," thus increasing the scheduled speed over the Souram Pass to the average for the rest of the line. Electrification has been decided upon as being more economical, and the Russians are now in the international market for the equipment necessary.

The scheme decided upon will use direct current at 3,000 volts, with regeneration of electrical energy when descending the steep gradients instead of using brakes. Three or four substations and 24 electric locomotives will be necessary; of the latter fourteen are to be ordered abroad and the remaining ten are to be built in Russia under the supervision of the foreign contracting concern. The value of the order to be placed abroad is about $1,750,000. The electrification of the Souram Pass is the first of several electrification schemes of Russian main lines. Plans are also in hand for the electrification of other sections—viz., of the Moscow-Kazan and Moscow-Koursk Railways.

◆

Purchasing Agents to Meet

Approximately 1,500 industrial buyers will study the latest economic changes of their profession at the fourteenth annual meeting of the National Association of Purchasing Agents to be held at the Hotel Statler, Buffalo, N. Y., from June 3 to 6 inclusive. The convention will attract the purchasing agents in practically every industry in the United States, Canada, and Mexico, whose combined buying power annually runs in the billions. These industrial buyers will study commodity trends and business conditions, up-to-the-minute purchasing practices, new sources of supply, new services, and new products.

It is realized that the downward trend in commodity prices is bringing about tremendous fundamental changes that strongly militate against the success of many companies, while at the same time working in favor of others, and that assistance in buying right, under these changing economic conditions, is the greatest need of the purchasing agent. For this reason much stress is being laid upon the development of a strong convention program which will anticipate the buyer's needs.

Apart from the general sessions, a great deal of time will be allotted to the various industrial groups within the association so that they may convene on their common interests. Buyers for particular industries, for instance, such as public utilities, oil companies, banks and insurance companies, mining, smelting, and refining concerns, etc., as well as those interested in major commodities, such as coal, iron and steel, textiles, etc., will have ample opportunity to thrash out their own problems and discuss and hear the latest developments of importance.

Supplementing the convention itself, there will be an exhibit of industrial equipment, services, and improved products. This is called the "Informashow" because of its informative character. The show is of unusual merit and affords each purchasing agent an opportunity to keep abreast of development. In the past it has proved very educational.

Exhibitograph No. 6.

MANUFACTURERS!

Save by Spending for an

A.E.R.A. Exhibit

Space Diagrams and Applications

READY APRIL 12

Convention Sept. 28 to Oct. 4
New Atlantic City Auditorium

WILL YOU BE THERE?

◆

Square D & Industrial Controller Unite

Manufacturing, financial and engineering resources of the Square D Company, Detroit, Mich., and Peru, Ind., and of the Industrial Controller Company, Milwaukee, Wis., have been united. Henceforth the two companies will be conducted under one management and will be known as the Square D Company. The new company will serve the industry through three divisions, the switch and panelboard division, Detroit; the porcelain division, Peru, and the industrial controller division, Milwaukee.

The management of this new and larger Square D Company will be in the same hands that guided the two combining companies previously. T. J. Kauffman continues as president and operating head of the business. A. A. Schueler, for several years sales manager of the Square D Company, becomes general sales manager of the new organization. F. W. Magin, who was general manager of the Industrial Controller Company, will continue as general manager of the industrial controller division of the new Square D Company, in addition to becoming vice-president of the company. H. L. Van Valkenburg will be chief engineer of the industrial controller division of the new Square D Company, continuing in the same position he held with the Industrial Controller Company.

ELECTRIC RAILWAY MATERIAL PRICES—MARCH 26, 1929

Metals—New York

Copper, electrolytic, cents per lb.	23.775
Lead, cents per lb.	7.775
Nickel, cents per lb., ingot	35.
Zinc, cents per lb.	6.975
Tin, Straits, cents per lb.	48.75
Aluminum, 98 to 99 per cent, cents per lb.	23.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	54.00
General service	31.50

Bituminous Coal

Smokeless Mine Run, f.o.b. vessel, Hampton Roads, gross tons	$4.375
Somerset mine run, f.o.b. mines, net tons	1.875
Pittsburgh mine run, Pittsburgh, net tons	1.80
Franklin, Ill., screenings, Chicago	1.70
Central, Ill., screenings, Chicago	1.175
Kansas screenings, Kansas City	1.70

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive, 9/16 in. and larger, cents per lb.	2.80
Tie plates (flat type), cents per lb.	2.15
Angle bars, cents per lb.	2.75
Rail bolts and nuts, cents per lb.	3.90
Steel bars, cents per lb.	1.925
Ties, white oak, Chicago, 6 in.x8 in.x8 ft.	$1.40

Hardware—Pittsburgh

Wire nails, base per keg	$2.70
Sheet iron (24 gage), cents per lb.	2.90
Sheet iron, galvanized (24 gage), cents per lb.	3.65
Galvanized barbed wire, cents per lb.	3.35
Galvanized wire, ordinary, cents per lb.	3.15

Waste—New York

Waste, wool, cents per lb.	18.
Waste, cotton (100 lb. bale), cents per lb.:	
White	17.25
Colored	13.5

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	10.6
White lead in oil (100 lb. keg), cents per lb.	13.50
Turpentine (bbl. lots), per gal.	$0.60
Putty, 100 lb. tins, cents per lb.	5.725

Wire—New York

Copper wire, cents per lb.	25.875
Rubber-covered wire, No. 14, per 1,000 ft.	6.95
Weatherproof wire base, cents per lb.	26.875

Paving Materials

Paving stone, granite, 5 in., f.o.b. New York—Grade 1, per thousand	$150
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	$2.70
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	51.00
Paving brick 3x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.25
Cement, Chicago consumers' net prices, without bags, f.o.b.	2.05
Gravel, ½-in., cu.yd., delivered	3.25
Sand, cu.yd., delivered	2.00

Old Metals—New York and Chicago

Heavy copper, cents per lb.	19.875
Light copper, cents per lb.	17.875
Heavy yellow brass, cents per lb.	12.875
Zinc, old scrap, cents per lb.	3.375
Lead, cents per lb. (heavy)	6.125
Steel car axles, Chicago, net ton	$17.75
Cast iron car wheels, Chicago, gross ton	14.75
Rails (short), Chicago, gross ton	19.25
Rails (relaying), Chicago, gross ton (65 lb. and heavier)	28.50
Machine turnings, Chicago, gross ton	7.75

Once to Every Car!

THE BIG EMERGENCY, ANTICIPATE IT WITH

Peacock Staffless Brakes

That one emergency may cost you plenty. Can you afford to be without braking equipment which functions positively in the emergency?

National Brake Company

890 Ellicott Square, Buffalo, N. Y.
Canada:—Lyman Tube & Supply Co., Ltd., Montreal
The Ellcon Co., General Sales Representative, 50 Church Street, New York City

CONSIDER this Palace Highway Pullman. Seats, too, made by Bender which means passengers not only ride but rest—an absence of strain, of poor posture, of restlessness, of muttered hopes for the ride to end.

Other Features:

Inside width exceeds any body on the market with the same outside dimensions. That means wider seats and wider aisle. Ample luggage space *inside*. Luggage protected against weather, against loss or damage claims. An individual light at each seat. A window for each seat—and every window can be opened all the way up—*every window*. Full head room in aisle.

The Palace Highway Pullman is a type of bus that will make money for you. Give it a chance to prove itself on your operations.

THE BENDER BODY CO.
W. 62nd & Denison, Cleveland, O.

BENDER BODIES

SPECIFY GOODRICH ON YOUR NEXT TRUCK OR BUS

"They deliver More *Miles per* T*ire* than any other,"

CHAS. F. EGLI, *Manager*
WHITE STAR LINES, INC.
Pittsburgh, Pennsylvania

OUT OF Pittsburgh, Pennsylvania, there radiate luxurious passenger bus lines in all directions . . . to Columbus, Ohio, to Wheeling, West Virginia, enabling you to go to almost any place within a day's ride . . . . in peace and comfort!

The buses of White Star Lines, Inc. pass one another at appointed places daily en route . . . loaded, *always* on time.

"We have been using Goodrich exclusively since June 1926," says Chas. F. Egli, Manager of White Star Lines, Inc., "and it has been our experience that they will deliver more miles per tire with a minimum of road delays than any make of tire previously used by us."

Similar satisfactory service is reported, too, by Geo. H. Williams, Manager of the Seattle Renton Stage Line, Inc., operating a fleet of white buses out on the West Coast.

He writes: "The performance of Silvertown Heavy Duty Tires is a big factor in maintaining our schedule. Besides being particularly free from the usual tire troubles experienced in bus service, we have secured what we believe to be exceptional mileage, some of the tires having delivered upwards of 60,000 miles."

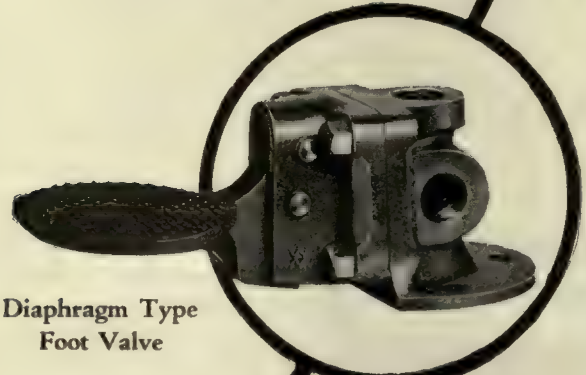
Indeed comfort does contribute to the popularity of a bus line; but so do dependable schedules. The full measure of comfort and dependability, with *profit* from long mileage *added,* are assured when Goodrich Heavy Duty Silvertowns are used on your buses. Remember them for *mileage,* comfort *and* dependability . . . Goodrich Silvertowns.

Goodrich HEAVY DUTY Silvertowns

THE B. F. GOODRICH RUBBER CO., *AKRON, OHIO*
Established 1870
Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Co., Kitchener, Ont.

We could not improve the Principle . . . So we improved the Details

Diaphragm Type
Cut-Off Valve



Diaphragm Type
Foot Valve

Because the basic idea of interlocking power, brakes, and door control to provide maximum safety and convenience for cars operated by one man was sound in principle it has won universal recognition.

But experience has given us a better understanding of the functional requirements of equipment details, and improvements have been made as needed. To simplify installation and reduce air leakage, a Foot Valve and Cut Off Valve of the "WABCO" Diaphragm Type are now furnished with Safety Car Control Equipments.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

The Safety Car Control Equipment has been a vital factor in safeguarding accelerated transportation.

Exide
MOTOR COACH
BATTERY

Fares show the way to Better Business

They choose the well-lighted motor coach that gives them READING COMFORT

TWO motor coaches may be identical in almost every respect. But if one is brightly lighted and one is dim inside—Mr. and Mrs. "Fare" will choose the bright motor coach. It gives them *reading comfort* as well as riding comfort. For comfortable, well-placed reading lights make the trip seem shorter—the service more friendly.

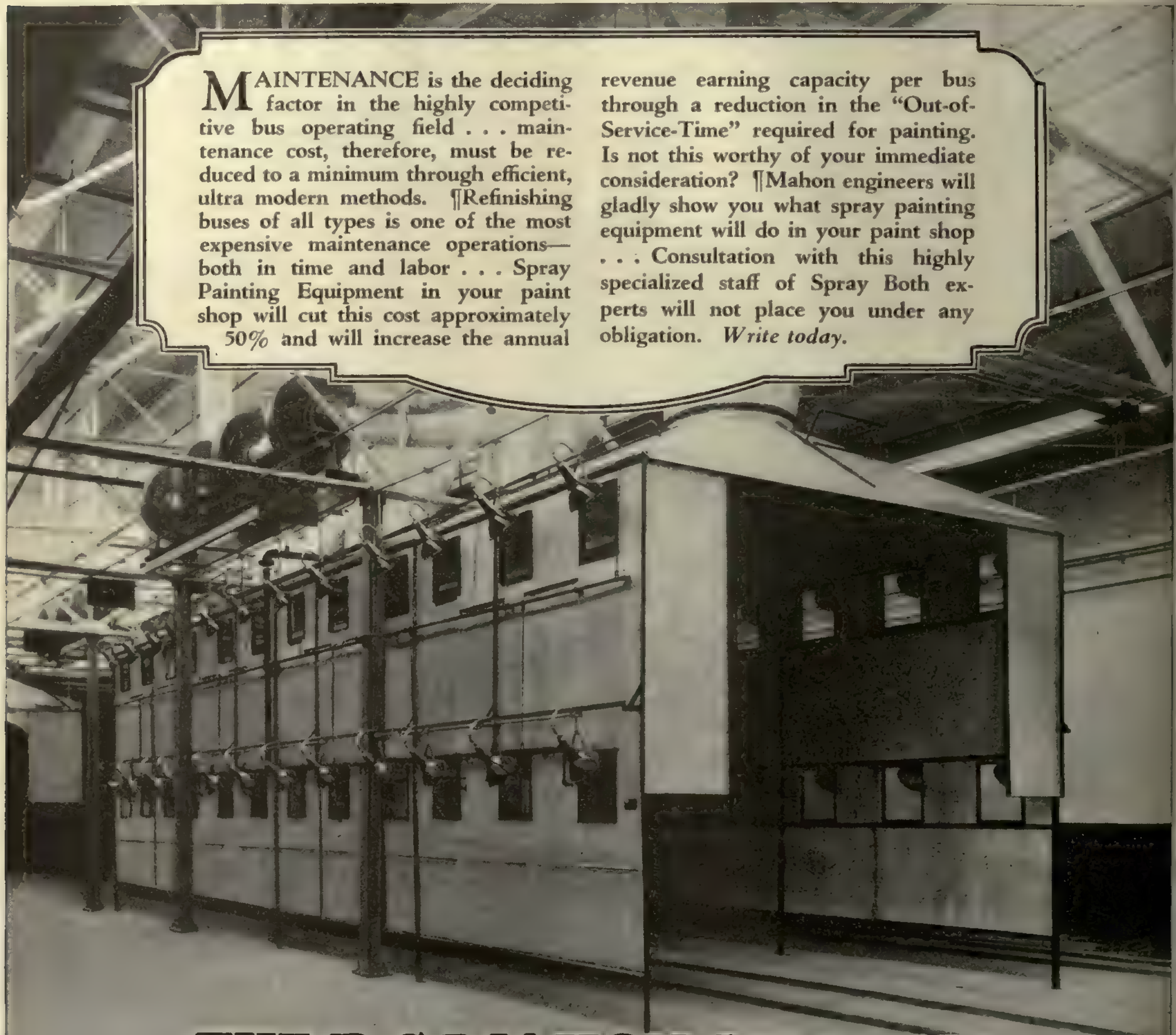
To maintain this constant light through long hours of gruelling service, a powerful generator is needed—backed by a dependable storage battery. Exide Motor Coach Batteries were designed for just such hard work—such continued exhausting service.

Exide engineers have been building batteries for forty-one years. They know the hard job a motor coach battery must perform. The Exide Motor Coach Battery has the stamina for long running hours—the reserve power for peak lamp loads—the rugged strength for years of day-in-and-day-out duty. And the operating cost is surprisingly low . . . made possible by the scientific construction. Small wonder that hundreds of operators use Exide exclusively.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, Toronto

Spray Painting Equipment Reduces Maintenance Cost



MAINTENANCE is the deciding factor in the highly competitive bus operating field . . . maintenance cost, therefore, must be reduced to a minimum through efficient, ultra modern methods. ¶Refinishing buses of all types is one of the most expensive maintenance operations—both in time and labor . . . Spray Painting Equipment in your paint shop will cut this cost approximately 50% and will increase the annual revenue earning capacity per bus through a reduction in the "Out-of-Service-Time" required for painting. Is not this worthy of your immediate consideration? ¶Mahon engineers will gladly show you what spray painting equipment will do in your paint shop . . . Consultation with this highly specialized staff of Spray Both experts will not place you under any obligation. *Write today.*

THE R.C.MAHON COMPANY
DETROIT, MICHIGAN

Manufacturers of Spray Booths and Exhaust Stacks, Industrial Drying Ovens and Blow Pipe Systems

MAHON

SPRAY BOOTHS & EXHAUST STACKS
• DESIGNED FOR FIRE SAFETY •

Another Tribute

to

TUCOLITH

Cincinnati orders 100

cars—all floored with

TUCOLITH

TUCO PRODUCTS CORPORATION

Executive Offices, 30 Church Street, NEW YORK

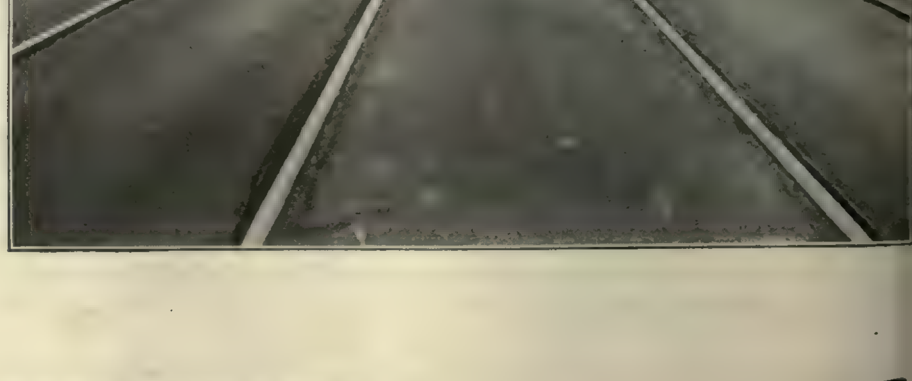
80 East Jackson Boulevard, CHICAGO, ILL.
1333 G St., N. W., WASHINGTON, D. C.
915 Olive Street, ST. LOUIS, MO.
751 Monadnock Building, SAN FRANCISCO, CAL.
MONTREAL, CANADA ST. PAUL, MINN. LOUISVILLE, KY. HOUSTON, TEXAS BOSTON, MASS.

They multiplied fifty-

TYPICAL installations of Carey Elastite System of Track Insulation on the Cincinnati, Hamilton & Dayton Railway. Note the neat appearance of the roadway, since this improved track insulation was installed.

THREE years ago, the Cincinnati, Hamilton & Dayton Railway Company began to improve their extensive properties throughout Southern Ohio. By way of experiment, they "cushioned" a section of track with Carey Elastite System of Track Insulation—two thousand lineal feet of it.

Immediately they noticed a silencing of excessive track noise—as well as a lessening of wear on the paving alongside the rails. Patrons, too, began to comment on how much more smooth-riding the CH&D cars were. Carey



the "trial footage" fold!

Elastite System of Track Insulation certainly was a decided success! Small wonder, then, that, since '26, CH&D officials have installed no less than fifteen thousand additional feet of this remarkable traction improvement!

Electric railways in more than 150 cities, large and small, are being given the lasting protection of Carey Elastite System of Track Insulation. Of course, you will want to know more about this highly-endorsed traction improvement. Write.

THE PHILIP CAREY COMPANY · *Lockland* · CINCINNATI, OHIO

Carey Elastite

REG. U.S. PAT. OFF.

TRADE MARK REGD. U.S. PATENT OFFICE

SYSTEM OF

TRACK INSULATION

. . . an asphaltic compound substantially reenforced with asphalt-saturated fibre preformed under heavy pressure. Impervious to moisture and temperature changes.

Ask yourself this question

Is the company from which I am buying lubricants competent to give me the highest service?

Your answer will take into consideration four things:

1. Its standing as an authority on all phases of lubrication.	The Texas Company *is* a recognized authority on scientific lubrication.
2. Its ability to furnish precisely the right lubricant for every purpose from its own line.	The Texas Company *does* manufacture in its own refineries, with its own resources from source to sale, a Texaco lubricant for every known purpose.
3. Its ability to deliver the lubricant specified at all times.	The Texas Company *has* a world-wide organization with distribution facilities everywhere.
4. Its willingness to co-operate in attaining the highest lubricating efficiency at the lowest possible cost.	The Texas Company *does* co-operate with executives at all times in securing better lubrication.

There is a Texaco Lubricant for Every Purpose
Texaco Lubrication Service is available everywhere

TEXACO LUBRICANTS

THE TEXAS COMPANY

TEXACO T

17 Battery Place
New York City

Offices
in Principal Cities

Signaling to Meet Competition — — — — —

WHEN present day competition with other systems of travel gets serious, the best answer usually is "Union" signals. A properly signalled system permits higher speeds. Time saved is money earned.

The Pittsburgh Railways Company is finding its A.P.B. installation of 58 "Union" color-light signals between Pittsburgh and Washington, Pa., an investment well placed. So much so in fact has this been the case, that other similar installations are being made and are being contemplated.

Write or call our nearest office for additional information. Our specialists are at your service and will gladly assist you in making a survey of your lines. No obligation.

1881 **Union Switch & Signal Co.** 1929

TRADE MARK

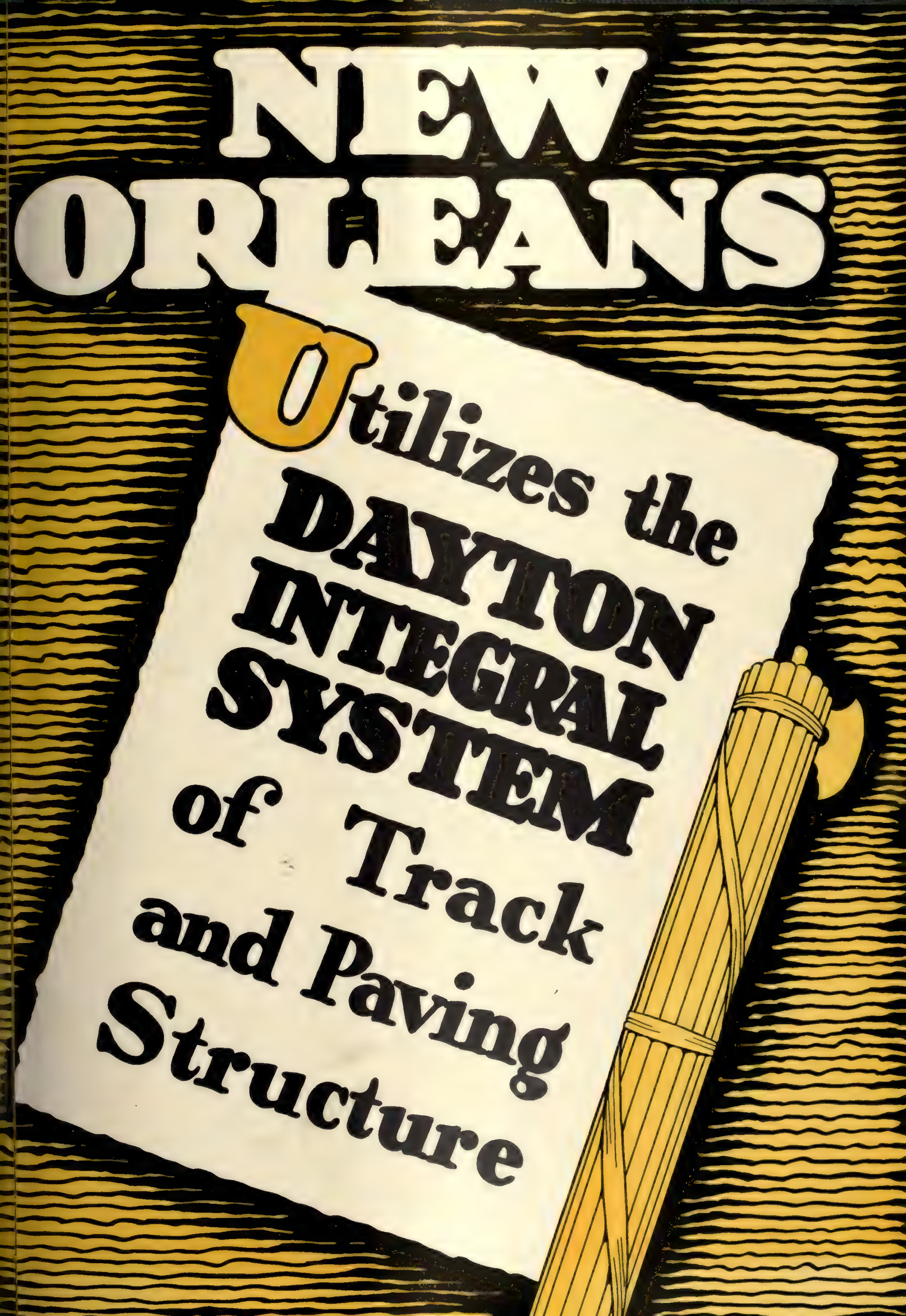
SWISSVALE, PA.

ew York Montreal Chicago St. Louis San Francisco

Less noise
greater comfort
reduced weight
less power consumed
mean
lower cost
passenger~miles
and bigger profits

TIMKEN WORM DRIVE TRUCKS
FOR ELECTRIC RAILWAY CARS

THE TIMKEN-DETROIT AXLE CO., DETROIT, MICH.


NEW ORLEANS
Utilizes the
DAYTON
INTEGRAL
SYSTEM
of Track
and Paving
Structure

MAYER ISRAEL & CO.
Stevens
UNITED STATES BRANCH
CANAL-COMMERCIAL
TRUST & SAVINGS
BANK
INTEREST PAID ON SAVINGS ACCOUNTS
SAFETY DEPOSIT BOXES FOR RENT

New Orleans Utilizes The Dayton Integral System of Track and Paving Structure

A thorough analysis of track costs by the New Orleans Public Service Inc. during the past two years brought to life a number of important facts. It was found that the value of the road bed was over one half of the total investment in railway property, and that maintenance costs were staggering. Specific analysis in a number of cases indicated that in an endeavor to make the track last for twenty years or more, *the cumulative maintenance costs over this period equalled and often exceeded the original investment cost.*

With a view of developing a type of track construction that would have a life commensurate with the required investment and minimize maintenance costs, a thorough study and analysis of track designs was undertaken. Past practices were reviewed, inspection and investigation of track designs in other Cities of the United States was made, materials were tested, and a type of track design developed, based upon thorough engineering analysis and the proper application of construction materials.

Dayton Ties are being utilized in this developed type of construction. This improved design does not cost as much as the obsolete type of track previously employed under like conditions.

We believe the New Orleans Public Service Inc., in their research and development of this inexpensive but more nearly permanent type of paved track construction, which can be used to an advantage by Street Railways anywhere, has performed a service of inestimable value to the industry.

What the Dayton Integral System of Track and Paving Structure Means to You

Increased Life With Reduced Maintenance
Less Costs

Dayton Integral System of track and pavement construction, by utilizing the concrete paving base formerly bisected by wood ties, combines the track foundation and pavement structure into a monolithic unit of maximum stability and ruggedness.

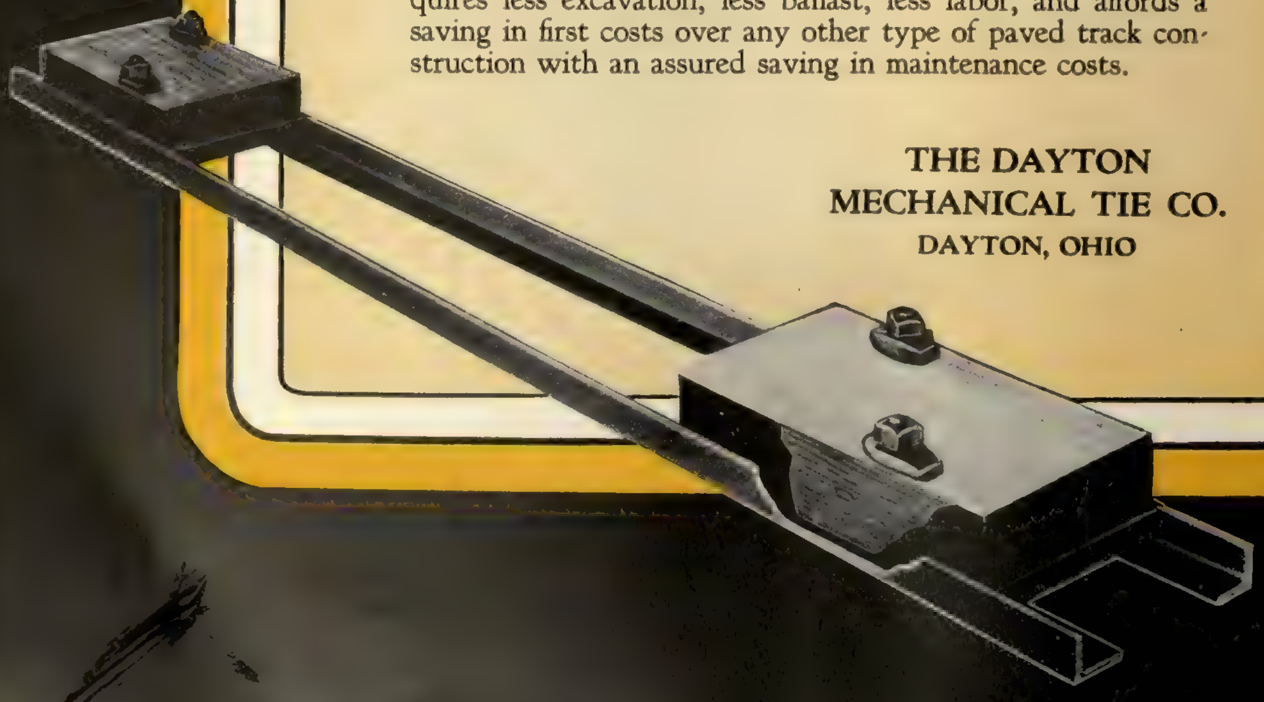
The steel angles of the Dayton Tie provide a transverse reinforcement of the foundation in a plane, where the stresses and strains tend to produce cracking and disintegration of the concrete.

The combined constructional features of the rail anchorage absorb and dissipate rail vibration, thus protecting the foundation and pavement from this abuse.

Reinforced concrete, adequately protected from vibration has proven itself to be a material of long and useful life for industrial application. Rails, laid upon a reinforced concrete foundation, with a *vibration absorbing anchorage,* provide a track structure that will develop the full wearing life of the component parts *with no major maintenance at all.*

The Dayton Integral System of Track Construction requires less excavation, less ballast, less labor, and affords a saving in first costs over any other type of paved track construction with an assured saving in maintenance costs.

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO



mileage

FISK'S excess *mileage* is due to two unique features...the *All-Cord* carcass and the Multiple Cable Bead.

The *All-Cord* process does away with cross threads in the tire fabric...prevents internal friction and overheating.

The Multiple Cable Bead gives a solid grip at the rim and adds extra strength to the sidewalls. It provides a firm foundation for the frictionless *All-Cord* action.

These two Fisk features give Fisk Motor Coach Balloons the stamina to pile up *mileage* over any kind of going. Try Fisks on your hardest routes... you'll find they help keep operating costs down to a profitable level.

THE FISK TIRE COMPANY, INC.
Chicopee Falls, Mass.

FISK

MOTOR COACH BALLOON

Chicago Surface Lines
Latest Type
Car

Passengers enter at front and leave through the two center doors. These cars seat 60 passengers comfortably.

Thirty-three of these cars are being built
by Cummings Car and Coach Co.

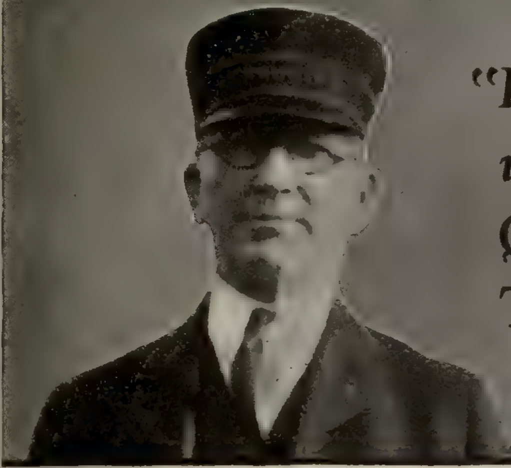
Street car transportation is a necessity.

The modern attractive, comfortable car is a business builder and is bound to increase patronage. Its convenience has never been equalled.

"There's no substitute for Street Railway Service."

All Types of latest design city and interurban cars
are built by—

CUMMINGS CAR AND COACH CO.
111 W. MONROE ST.
CHICAGO, ILL.



"Passengers Compliment Me upon the Easy, Smooth and Quiet-Riding of our Timken-Equipped Trains"

That's the Conductor's Story

Chicago, Milwaukee, St. Paul and Pacific Railroad Com

573 Superior Street,
Milwaukee, Wis.
December 14, 1928.

Mr. W. C. Sanders,
General Mgr. Railway Division,
The Timken Roller Bearing Company,
Canton, Ohio.

Dear Sir:-

I am sorry that our meeting on the train the other day when coming into Chicago was so brief, for I was anxious to talk to you at greater length and tell you some of my observations as concerns your roller bearings that are being used on our Milwaukee trains.

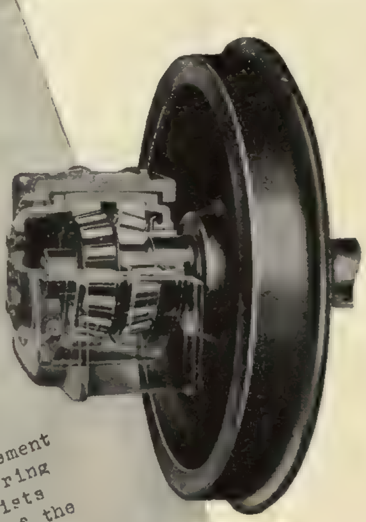
I do, however, want to take this opportunity to tell you that during the years that I have been in the railroad service as a conductor on passenger trains, I have never seen any one improvement in train service meet with such popularity as have the roller bearing equipped trains. On nearly every trip I am complimented by tourists and passengers upon the easy, smooth and quiet riding qualities of the train, and our plain bearing trains are hard to beat. Many of the tourists, upon leaving the train at Chicago have made a special effort to tell me what a pleasant and comfortable journey they have had, at the same time expressing their desire to return west on the Milwaukee Road.

The advantages in train operation, resulting from the use of roller bearings, and these expressions which I hear daily from the passengers, have made me an ardent enthusiast of your bearings.

I hope that the next time you come to Chicago I may have the privilege of again seeing you.

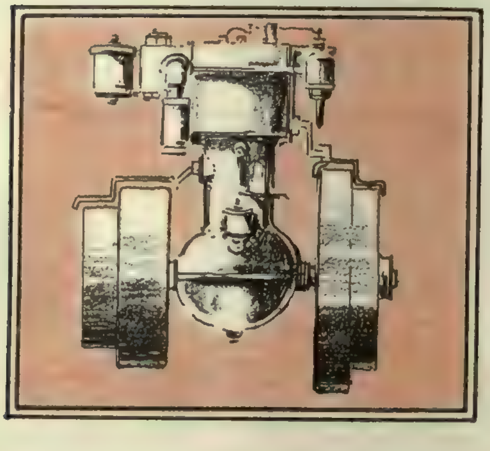
Yours truly,

a. Kirby
Conductor.



TIMKEN *Tapered Roller* **BEARINGS**

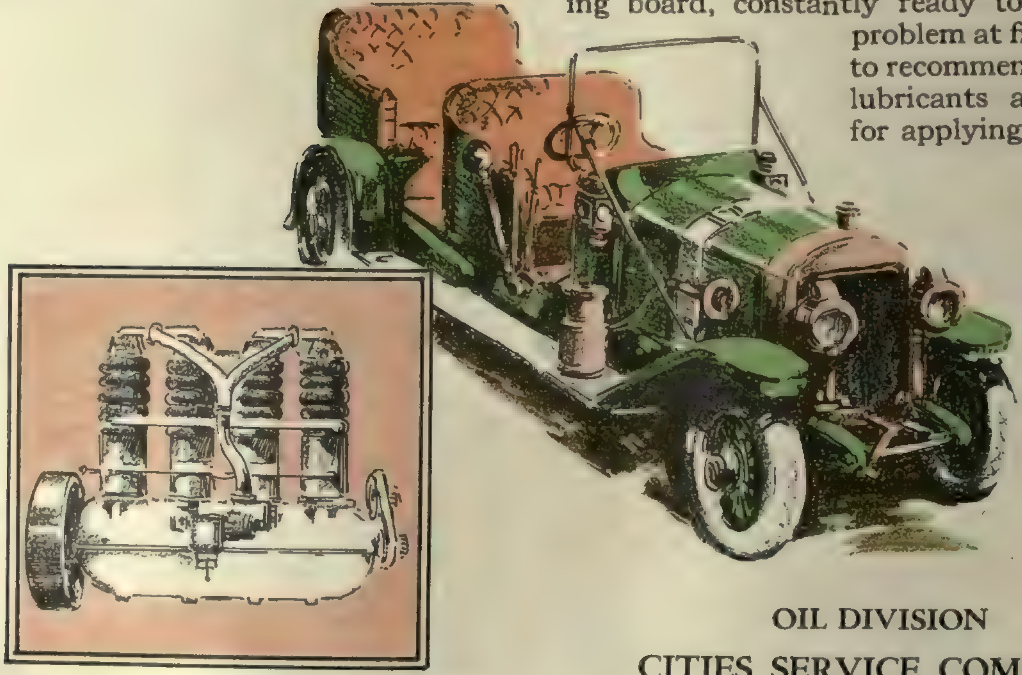
Longer



An improved lubrication servic that meets today's motor an load requirements

Engine overheating due to continual operation; heavy strain on moving parts due to peak loads; excessive wear from high speeds to maintain schedules; imperfect lubrication under ever-changing weather conditions—these are causes of high operating and maintenance costs in bus transportation systems.

KOOLMOTOR Bus Oils are specially processed to reduce these difficulties to a minimum. They are pure petroleum products, perfected in Cities Service laboratories by Cities Service lubrication experts. These same experts can help you safeguard your profits by lowering operating expenses. They are available without cost, as a free consulting board, constantly ready to study your problem at first hand and to recommend the proper lubricants and methods for applying them.



OIL DIVISION
CITIES SERVICE COMPANY
60 WALL STREET, NEW YORK, N. Y.

Koolmotor Products

Mileage Life

Koolmotor Bus Oils are carefully refined from 100% Pennsylvania crude base for the special lubrication requirements of heavy duty, high speed motor bus engines. The methods used in refining them are based on the findings of the highly trained corps of Cities Service lubrication engineers who are always on the alert to change refining formulas or develop new ones to accommodate ever-changing lubrication conditions.

Where Selection is decided by Performance

"NATIONAL" TUBULAR STEEL POLES *Predominate*

EXPERIENCE has taught many valuable lessons in the selection of poles for trolley lines, electric lighting, telephone, telegraph, and signal systems. Perhaps the lessons of greatest value are those which resulted in the policy of choosing poles for long life, reliability, and especially, for safety. The recognized safety (dependability) of "NATIONAL" Tubular Steel Poles is a consideration of first and ultimate importance, as evidenced by the extensive use of "NATIONAL" Poles throughout America.

Wherever the factors ot safety, strength and appearance dominate, it will pay you to specify "NATIONAL" Poles. Made by the largest manufacturer of wrought tubular products in the world, with facilities for meeting a wide range of specifications in pole construction. Ask for Bulletin No. 14.

NATIONAL

NATIONAL TUBE COMPANY • Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

Italy Repeats

with
830 Sets of *"Tool Steel"* Gears
Then With
1200 More Sets of *"Tool Steel"* Gears

Last year the City of Milan, Italy, began to revamp their electric railway system. After exhaustive tests of both American and European gears they placed an order for 830 sets of Tool Steel "Quiet" Gears.

Recently we received a cable order for *1200 additional sets* to complete the job.

Proof positive of the superiority of "Tool Steel" Quiet Gears.

The Tool Steel Gear and Pinion Company
Cincinnati, Ohio

Reliable Performance
Simplicity of Application

Steel terminals brazed to the flexible copper conductor—braze made in a controlled heat electric furnace—result, each bond has the strongest electrical union between copper and steel it is possible to secure. Reliable performance is a feature of Erico Type A T R Rail Bonds.

The round steel terminal occupies little space on the ball of the rail—the arc flashes down into the welding vee, clings without sputtering—a minimum amount of metal is required to secure full conductivity. Simplicity of application is another feature of A T R Bonds.

Let us send you samples
for inspection and test.

THE ELECTRIC RAILWAY
IMPROVEMENT COMPANY
2070 E. 61st Place, Cleveland, Ohio

For Better Bonds and Bonding Use

ERICO
RAIL BONDS AND BONDING OUTFITS

The public has tasted luxury in transportation and likes it. Nothing short of full measure will now satisfy it in public transportation. The industry must meet changed conditions . . . and that quickly . . .

from an editorial in *Electric Railway Journal*, February 16, 1929.

WE ARE READY

Cincinnati has the designs—Cincinnat
has built the most modern cars fo
years, is building the most modern car
today—cars that are modern in efficienc
as well as luxury. And Cincinnati's Sur
vey and Plan Method of selling enable
any property to have modern cars at onc
—and to pay for them out of increase
earnings.

We recently submitted a Survey and Pla
to a large property in Indiana. The pla
was approved and Cincinnati Cars sup-
plied. Running time on all routes was cu
about 8%. The shop organization was cut
creating a saving of $9,000.00 in wages
Power bills were so reduced that a
monthly saving of $3,000.00 in powe
was established (the power rate is 1.1c pe
K.W.H.) Figures to date indicate an an

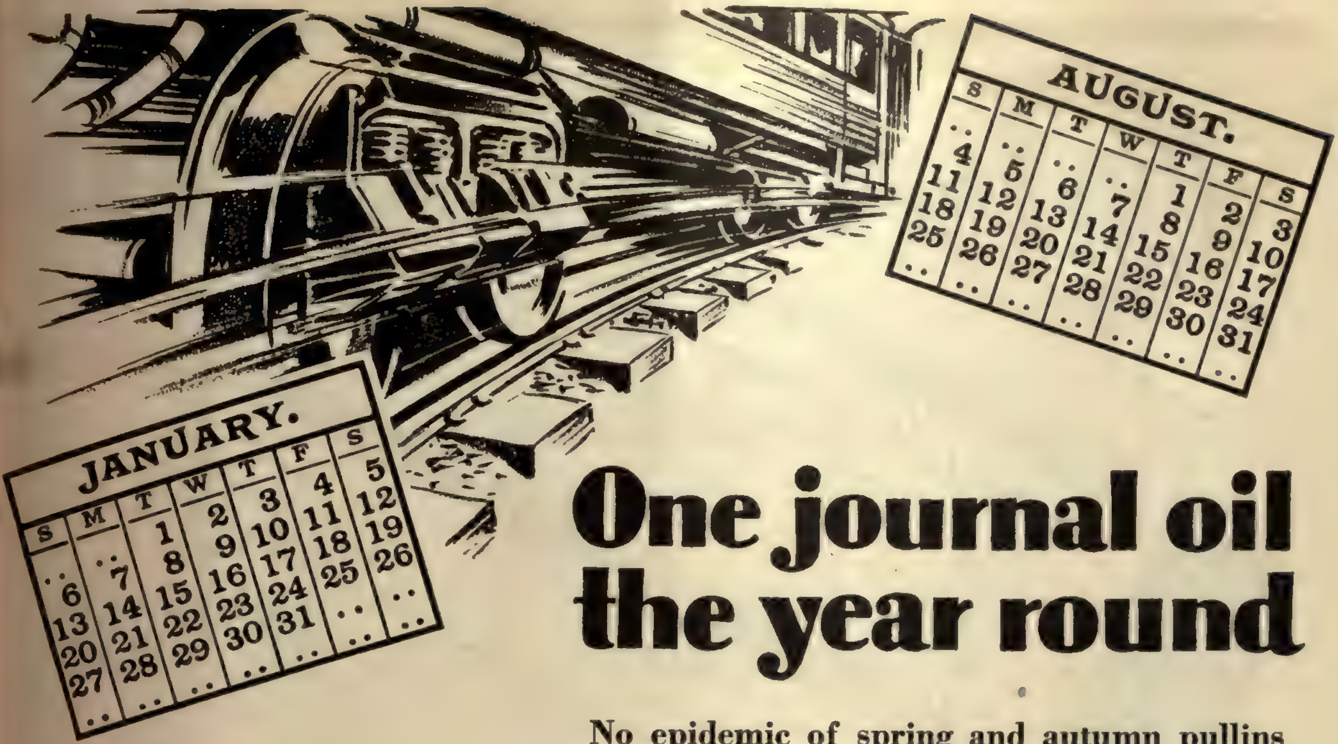
TO GO AHEAD

ual saving of approximately $85,000.00.
s soon as the planned one-man car oper-
tion is put into effect a further saving
f about $25,000.00 will be made. And
hese savings tally exactly with our ori-
inal Survey figures.

he Electric Railway Industry is paying
high price for the continued operation
f its obsolete equipment. Some few com-
anies have had the courage to junk old
ars, and buy new ones. That courage has
aid! Those companies are giving the
ublic what it wants, and the public is
esponding with increased patronage.
et us lay our cards on the table. The
ublic has tasted luxury in transporta-
ion and demands it. We are ready to go
head. Are you?

THE public has a quaint habit of demanding luxurious transportation —at old-fashioned prices. That demand can be met with the right kind of rolling stock and the right kind of operation. We do not advocate street cars where coaches should be used— nor try to sell coaches where street cars will do the job. But we will welcome the opportunity to submit to you a survey and plan—based on the right kind of transportation units— for we build both cars and coaches. Cincinnati cars are as modern as this morning, Versare Coaches have a distinctive passenger appeal—both bring a luxury to transportation that pays!

THE CINCINNATI CAR CORPORATION
Winton Place
Cincinnati, Ohio



One journal oil the year round

No epidemic of spring and autumn pullins for oil change . . . no rush to pull out old waste and repack journal boxes . . . no shifting of schedules to compensate for cars out of service . . . and an important item of maintenance cost eliminated. How? By using Superla Car Journal Oil.

Superla Car Journal Oil refutes the theory that winter and summer grades of oil are necessary. It has proven successful in all seasons in high speed interurban and ordinary street car service. It has made possible marked savings in power and waste consumption, increased the life of bearings and reduced bearing temperatures.

The flexibility of Superla Car Journal Oil, its ability to stand up under heavy service requirements and its wide atmospheric temperature range make it the ideal year around car journal oil.

Our engineers will gladly give you additional information and data. Consultation with them places you under no obligation.

Listen In

CHICAGO SYMPHONY ORCHESTRA

Sunday Evening 6 to 7 o'clock
Central Standard Time

Over Following

WGN Chicago
WTMJ Milwaukee
KSD St. Louis
WOC Davenport
WHO Des Moines
WDAF Kansas City
WOW Omaha
KSTP St. Paul
WEBC Superior

STANDARD OIL COMPANY (*Indiana*)

General Offices: 910 South Michigan Ave. CHICAGO, ILLINOIS

ILLINOIS
Chicago
Decatur
Joliet
Peoria
Quincy

INDIANA
Evansville
Indianapolis
South Bend

KANSAS
Wichita

IOWA
Davenport
Des Moines
Mason City
Sioux City

S. DAKOTA
Huron

MICHIGAN
Detroit
Grand Rapids
Saginaw

N. DAKOTA
Fargo
Minot

WISCONSIN
La Crosse
Milwaukee
Green Bay

MINNESOTA
Duluth
Mankato
Minneapolis

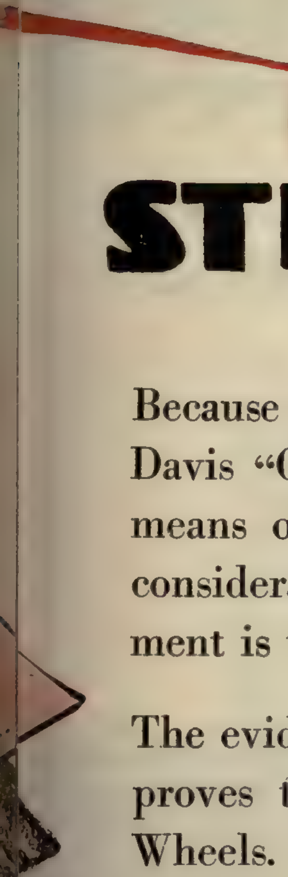
MISSOURI
Kansas City
St. Joseph
St. Louis

1316

One less ma

Car Repair Report Date 4/16
Car No. 1292 Division 3
The above mentioned car was inspected today and found to be in need of repairs as listed below:
Swing Door Bumpers
Brake Cylinder
Wheels need re-turning
Emergency Doors
Rail Sockets
Rod Terminal
Vestibule Sash
Drain Valve
Switches
Rope
Oil Box Covers
Covers
Plates
Floor Plates
Suspension Bolts
Intake
Breaker Buttons
Catchers
Fender Aprons
Armature Bearings
Top Gear Case Bolts
Remarks
Mr.
Repairs have been completed on part
Date forwarded to car house 4/16

AMERICA



tenance item

with

DAVIS

One Wear

STEEL WHEELS

Because of the heat treated special composition steel used, Davis "One Wear" Wheels never need re-turning. This means one less item in your maintenance costs and a considerable reduction in lost time while your equipment is tied up in the shop.

The evidence of over half a million wheels now in service proves that Davis Steel Wheels are truly "One Wear" Wheels.

AMERICAN STEEL FOUNDRIES
NEW YORK CHICAGO ST. LOUIS

STEEL FOUNDRIES

ASF

The engine cooling of A. C. F. buses is efficiently handled with the Long radiator. . . .

LONG MANUFACTURING CO.
Detroit - - Michigan

LONG

LONG PRODUCTS—AUTOMOTIVE CLUTCHES AND RADIATORS

LORAIN

Girder Rails

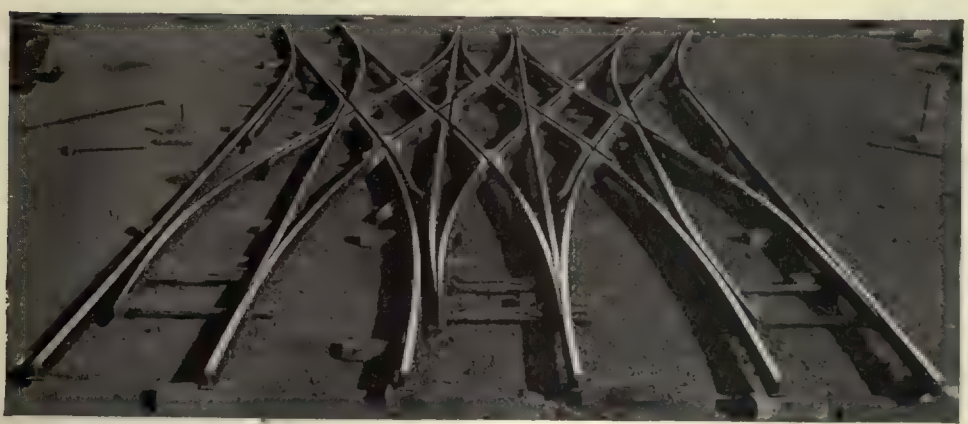
Girder Guard Rails

Plain Girder Rails

Rail Joints and
Track Accessories

Expansion Joints
for Electrically
Welded Track

Special Trackwork



Switches, Frogs and Crossings
in
Solid Manganese Steel,
Manganese Insert Construction,
Chrome Nickel Steel Insert
Construction and Built-up
Construction of all
heights and weights of rail

The Lorain Steel Company

General Offices: 545 Central Avenue, Johnstown, Pa.

SUBSIDIARY OF

UNITED STATES STEEL CORPORATION

Quality Products *Dependable Service*

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

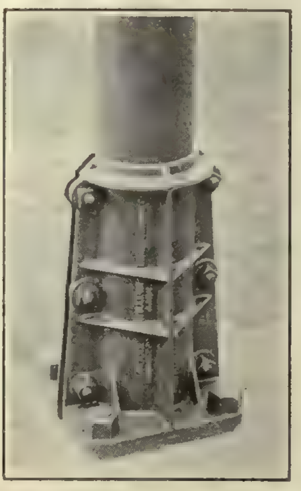
American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Portland Cement Company

Pacific Coast Distributors—United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle, Honolulu. *Export Distributors*—United States Steel Products Company, New York City

Sales Offices:

ATLANTA CHICAGO CLEVELAND DALLAS NEW YORK PHILADELPHIA PITTSBURGH

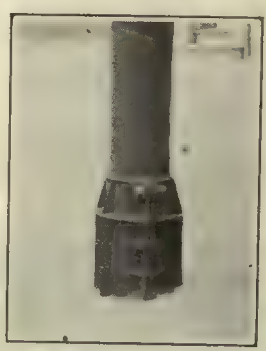
"B" Clamp Reinforcing Corroded Swaged Joint

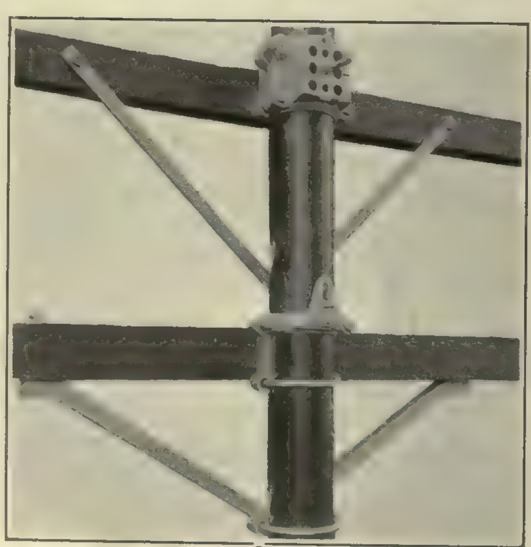


Typical Pole Mount Installation on Concrete

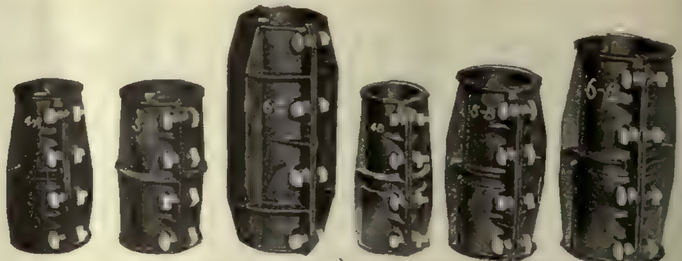
At Right—
"C" Clamp Supporting Pole Corroded at Base

Below—
Pole Mounts—12-in. to 6-in.





M.I.F. Crossarm Gain Installed



Typical M.I.F. Reinforcing and Extension Clamps

Tubular Pole Maintenance

It is not economical to replace a corroded tubular iron pole if it can be salvaged at reasonable expense. M.I.F. Tubular Pole Specialties prove most satisfactory and most economical as salvage devices.

"A" Reinforcing and Extension Clamps

—for reinforcing corroded upper joint where reduction in pipe size is full inch.
—for extending pole with section of pipe of one inch smaller diameter.
—for reinforcing at ground-line over collar.

"B" Reinforcing Clamps

—for reinforcing corroded upper joint where lower section is swaged over smaller pipe.

"C" Reinforcing and Extension Clamps

—for reinforcing poles corroded at ground-line— without collar, or after its removal.
—for extending pole with section of same size.

Variations of these types meet all conditions, including salvaging of ornamental poles.

Williams Pole Mounts

—for salvaging poles corroded at ground-line, by supporting them anchored to concrete base.
—for maximum clearance above ground with new or old poles, possibly jacked up out of ground.
—for anchorage on bridges, retaining walls, rock, etc.
—also provided in similar type for wood poles.

Crossarm Gains

—for attaching wood crossarms to tubular poles, with or without braces.

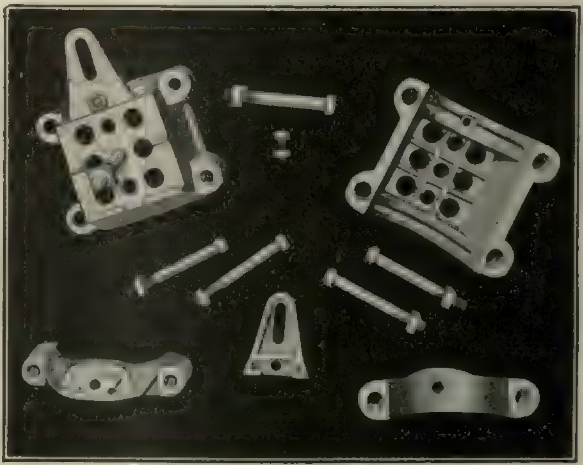
Cable Insulator Hangers

—for stringing signal wires, etc., along or across span wires.

Send for literature and prices

Malleable Iron Fittings Co.

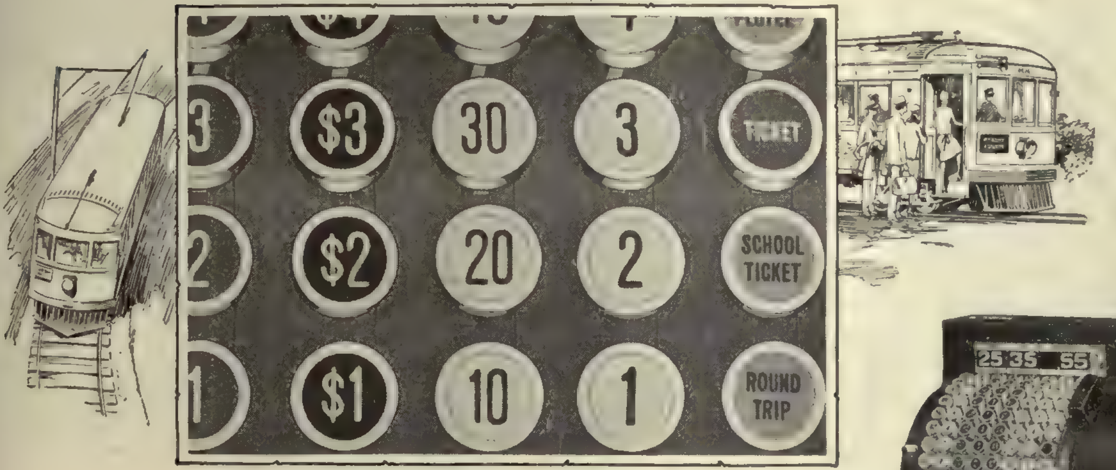
Pole Hardware Department
Factory and New England Sales Office: Branford, Connecticut
New York Sales Office:
Thirty Church Street
General Sales Agents elsewhere in U. S.:
LINE MATERIAL COMPANY, South Milwaukee, Wis.
Canadian Distributor: Canadian Line Materials, Limited, Toronto



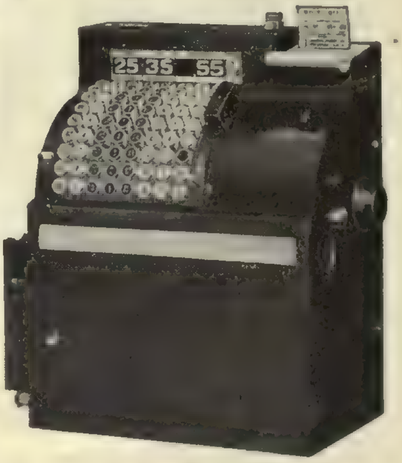
M.I.F. Crossarm Gain—Dis-assembled

Try this keyboard—

It is one of the most important features of the National Fare Register



Section of keyboard on National Fare Register, actual size



TAP the keys on this illustration as you would those of a real machine if you were recording a fare. They are exactly the same size as the keys on the keyboard of a National Fare Register.

Note how easy it is to pick out the correct key, the ample clearance between keys, the small chance to make a mistake by striking the wrong key.

Although the illustration cannot show it, these keys are of the most flexible type, easy to operate yet absolutely positive in their action. Once an amount is set up on this keyboard, it stays that amount until the transaction is completed or release key is pressed.

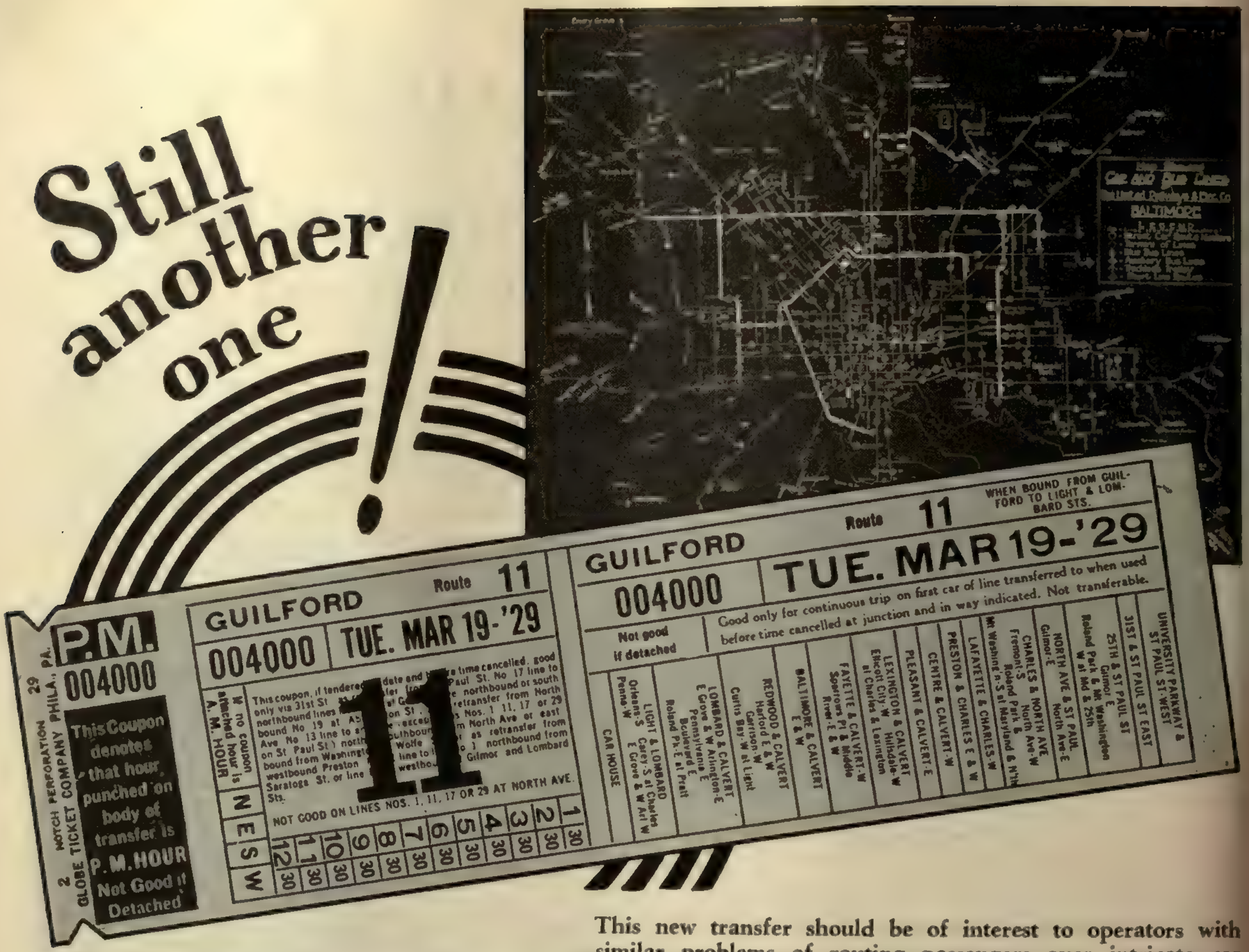
Only in National Fare Registers can interurban operators get the benefit of this fast, accurate and positive keyboard. *And the keyboard is just one of the ten distinctive features of the register.*

Ten Distinctive Features

Printed tickets
Printed trip sheet
Flexible keyboard
Special keys for each kind of fare
Public indication
Total of cash
Electric operation
Small size
Repeat key
Operator's identification key

THE NATIONAL FARE REGISTER

Product of The National Cash Register Company
Dayton, Ohio


Still another one!

29 NOTCH PERFORATION 2 GLOBE TICKET COMPANY PHILA., PA.

P.M.
004000

This Coupon denotes that hour, punched on body of transfer is P.M. HOUR
Not Good if Detached

GUILFORD Route 11
004000 TUE. MAR 19-'29

If no coupon attached hour is A. M. HOUR

This coupon, if tendered [illegible] date and [illegible] time cancelled, good only via 31st St [illegible] Paul St. No 17 line to northbound lines [illegible] northbound or south bound No 19 at [illegible] on St [illegible] retransfer from North Ave No 13 line to [illegible] except [illegible] Nos. 1 11, 17 or 29 on St Paul St) north[illegible] [illegible] outhbound [illegible] North Ave or east bound from Washingto[illegible] Wolfe [illegible] as retransfer from westbound Preston [illegible] line to [illegible] 1 northbound from Saratoga St. or line [illegible] westbo[illegible] Gilmor and Lombard Sts. 11

NOT GOOD ON LINES NOS. 1, 11, 17 OR 29 AT NORTH AVE.

N E S W

1 30 2 30 3 30 4 30 5 30 6 30 7 30 8 30 9 30 10 30 11 30 12 30

GUILFORD Route 11 WHEN BOUND FROM GUILFORD TO LIGHT & LOMBARD STS.
004000 TUE. MAR 19-'29

Not good if detached

Good only for continuous trip on first car of line transferred to when used before time cancelled at junction and in way indicated. Not transferable.

- CAR HOUSE
- LIGHT & LOMBARD Orleans-S Carey-S at Charles Penna-W E Grove & W Arl W
- LOMBARD & CALVERT E Grove & W Arlington-E Pennsylvania E Boulevard E Roland Pk-E at Pratt
- REDWOOD & CALVERT Harford E & W Garrison-W Curtis Bay-W at Light
- BALTIMORE & CALVERT E & W
- FAYETTE & CALVERT-W Sparrows Pt & Middle River-E & W
- LEXINGTON & CALVERT Ellicott City-W Hillsdale-W at Charles & Lexington
- PLEASANT & CALVERT-E
- CENTRE & CALVERT-W
- PRESTON & CHARLES E & W
- LAFAYETTE & CHARLES-W
- Mt Washing'n-S at Maryland & N'th
- CHARLES & NORTH AVE Fremont-S North Ave-W Roland Park & Gilmor-E
- NORTH AVE & ST PAUL North Ave-E
- Roland Park & Mt Washington W at Md & 25th
- 25TH & ST PAUL ST Gilmor E
- 31ST & ST PAUL ST EAST
- UNIVERSITY PARKWAY & ST PAUL ST-WEST

Baltimore
uses a specially designed
Globe Transfer

This new transfer should be of interest to operators with similar problems of routing passengers over intricate car systems.

It was designed by Mr. J. A. Stoll, Superintendent of Traffic, of the United Railways and Electric Company, of Baltimore. Baltimore's old system involved the issuing of transfers and identification checks where passengers used three cars to reach their destinations. The new transfer eliminates the identification check. The conductor of the second or crosstown lines simply detaches and returns to the passenger the "Re-transfer Coupon" for use under certain conditions on a third line.

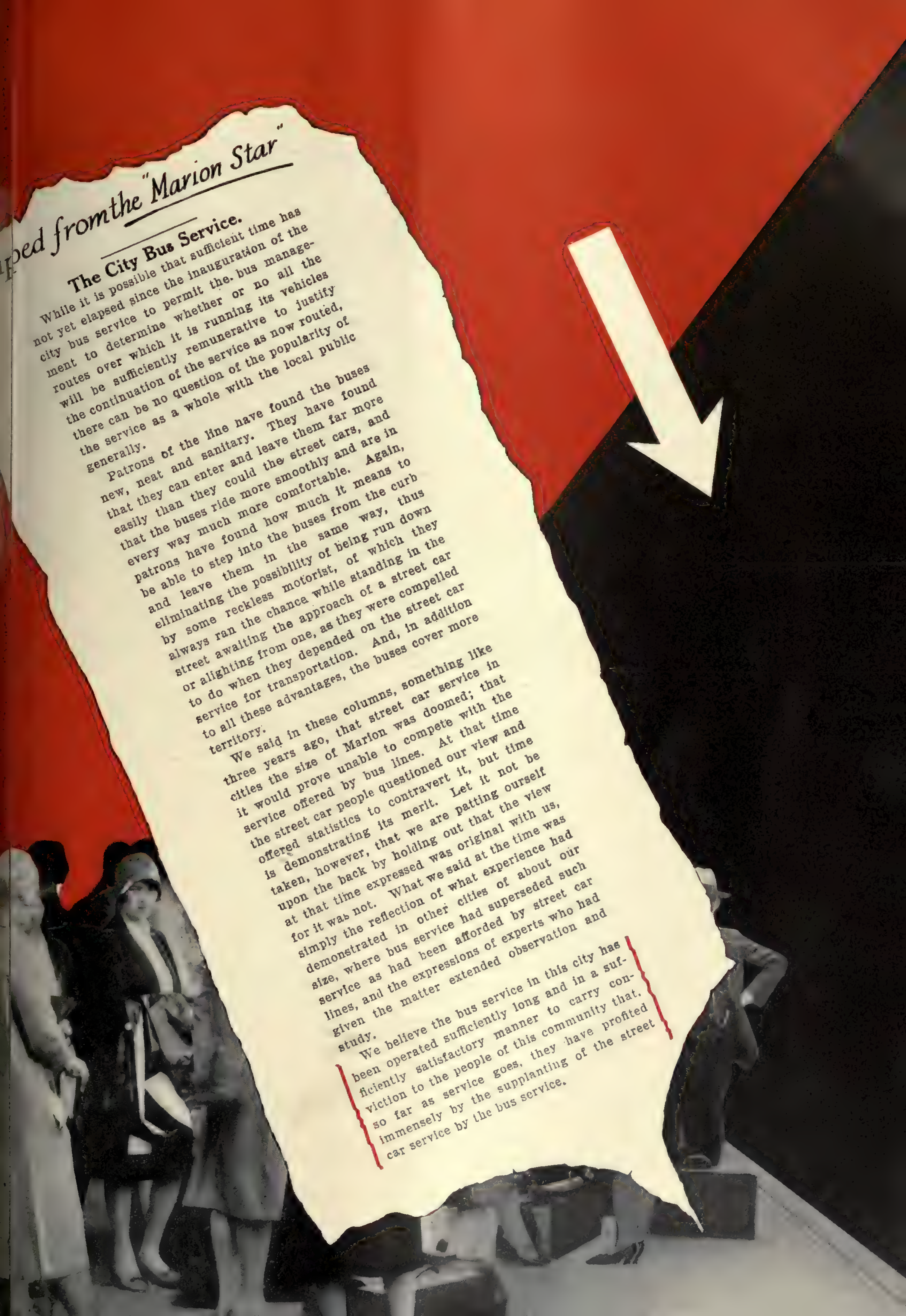
The United Railways and Electric Company of Baltimore say: "It is easier for the car rider to use and easier for the conductor to handle"— "Another advantage is that riders desiring to re-transfer need no longer board cars at the rear platform as formerly"— "Afford riders a quicker means of travel between outlying points without having to ride through the downtown section."

We shall be glad to explain the full advantages of this new "Re-Transfer" system. Our specialized experience enables us to design and supply a ticket or transfer system best adapted to your needs.

Globe
TICKET COMPANY
PHILADELPHIA

Factories:
Philadelphia
Los Angeles
Boston
New York
Jacksonville

Sales Offices:
Albany
Atlanta
Baltimore
Cincinnati
Cleveland
Pittsburgh



pped from the "Marion Star"

The City Bus Service.

While it is possible that sufficient time has not yet elapsed since the inauguration of the city bus service to permit the bus management to determine whether or no all the routes over which it is running its vehicles will be sufficiently remunerative to justify the continuation of the service as now routed, there can be no question of the popularity of the service as a whole with the local public generally.

Patrons of the line have found the buses new, neat and sanitary. They have found that they can enter and leave them far more easily than they could the street cars, and that the buses ride more smoothly and are in every way much more comfortable. Again, patrons have found how much it means to be able to step into the buses from the curb and leave them in the same way, thus eliminating the possibility of being run down by some reckless motorist, of which they always ran the chance while standing in the street awaiting the approach of a street car or alighting from one, as they were compelled to do when they depended on the street car service for transportation. And, in addition to all these advantages, the buses cover more territory.

We said in these columns, something like three years ago, that street car service in cities the size of Marion was doomed; that it would prove unable to compete with the service offered by bus lines. At that time the street car people questioned our view and offered statistics to contravert it, but time is demonstrating its merit. Let it not be taken, however, that we are patting ourself upon the back by holding out that the view at that time expressed was original with us, for it was not. What we said at the time was simply the reflection of what experience had demonstrated in other cities of about our size, where bus service had superseded such service as had been afforded by street car lines, and the expressions of experts who had given the matter extended observation and study.

We believe the bus service in this city has been operated sufficiently long and in a sufficiently satisfactory manner to carry conviction to the people of this community that, so far as service goes, they have profited immensely by the supplanting of the street car service by the bus service.

How Marion, *Ohio*, change

Complete Transportation Service now given by Yellow Coaches

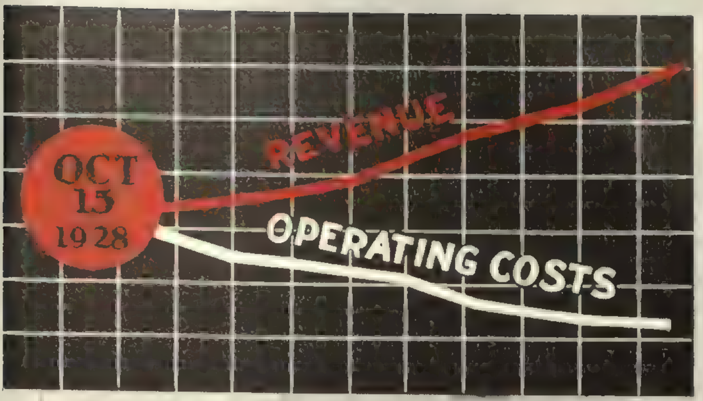
Revenues of the street railway serving the city of Marion, Ohio, a city of 35,000 population, had for the past few years been dwindling. The handwriting on the wall told a story clearly disheartening.

Funds were lacking to put equipment and track in good condition. The riding public was plainly disgruntled. Even the press came out boldly with the assertion that street car service was doomed—yet the operating company did the best it could to stem the tide. Fares were increased, but still revenue failed to keep pace.

Something drastic had to be done.

On October 4th, 1928, all trolley service was discontinued and on October 5th motor coach service was inaugurated with twelve Type "W" 23-passenger Yellow Coaches—*a complete replacement.*

Results were immediate. The citizens of Marion were well satisfied. Riding increased. Red figures changed to black. The Marion



Red figures into Black

Rapid Transit, Inc. (the operating company) began to make money and has good reason to be proud of the support extended by the public and the authorities.

The press, also, has changed its tone. What better evidence of satisfaction than the following extracts quoted from the editorial columns of the Marion Star of January 9, 1929—

"There can be no question of the popularity of the service as a whole with the local public generally . . . Patrons have found how much it means to be able to step into the buses from the curb and leave them in the same way . . .

"We believe the bus service in this city has been operated sufficiently long and in a sufficiently satisfactory manner to carry conviction to the people of this community that, so far as service goes, they have profited immensely by the supplantry of the street car service by the bus service."

Operating Cost
19.78 Per Coach Mile

	Cents per Coach Mile
Maintenance	2.68
Depreciation	3.76
Garage	0.42
Transportation	9.19
Administration	1.50
General	2.23
TOTAL	19.78

23 Passenger City Service

Marion Standardized on Type W YELLOW COACH

TWELVE 23-passenger City Service Type "W" Coaches were selected to render a complete local city service for Marion.

With a growing population of 35,000 and an area of 8 square miles to be served, Type "W" Yellow equipment was selected because it possessed all the modern qualities desired for rendering a local service to a progressive community of moderate size.

Style and graceful appearance, combined with practical operating utility—smooth 8-cylinder power, fast acceleration, quick, sure brakes, low operating cost and, for a community of this size, ample load capacity without crowding,—

Type "W" Yellow Coaches are ideally fitted for the kind of service they are now rendering the city of Marion.

General Motors Truck Co., Pontiac, Mich.

No. 8M5 Special

No. 327-M Special

No. 327-M Special seats are in use by the Virginia Electric and Power Company, which was awarded the Charles A. Coffin medal for 1928.

DESIGNED FOR INTERURBAN USE

THE 327-M Special is a popular Heywood-Wakefield electric railway seat. The deep, double spring construction of the cushion and the restful pitch of the spring-filled backs make this attractive style one of the most comfortable interurban seats ever offered.

The 8M5 Special is a de luxe interurban type with spring-filled seats and backs. It has been purposely designed and built to withstand the most severe use and abuse, while delivering trouble-proof service year after year.

Our car seating experts will be glad to assist in solving your equipment problems. This service is yours without cost or obligation. Just write to the nearest Heywood-Wakefield sales office.

HEYWOOD-WAKEFIELD COMPANY

Boston, Massachusetts

516 West 34th St., New York City
439 Railway Exchange Bldg., Chicago, Ill.
J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.
A. W. Arlin, Delta Bldg., Los Angeles, Calif.
H. G. Cook, Hobart Bldg., San Francisco, Calif.
The G. F. Cotter Supply Co., Houston, Texas
The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada

THE THINGS ELRECO STANDS FOR

Finest appearance—unusual strength—greatest adaptability—lightest weight—low installation and maintenance cost. Those are the things ELRECO stands for, the reasons why far-seeing companies in hundreds of cities and towns have installed Elreco Tubular Steel Poles.

Designed to lend beauty to the curb line, at the same time Elreco Poles are practical. Trolley span, lighting wires, lighting units and traffic signals can be all suspended from the same pole.

No longer is it necessary for individual companies to use separate poles. A combination of companies utilizing the same makes the reduced cost to each, of installation and maintenance, readily apparent.

A letter or card will promptly bring complete information.

The Electric Railway Equipment Co.

2900 Cormany Ave., Cincinnati, Ohio

30 Church Street, New York City

Busy Men often prefer to "See" you by Telephone

YOUR customers are busy people. There are times when they prefer that you visit them by telephone. You save their time as well as your own.

A sales executive does 77% of his out of town business by telephone. He says, "you get the undivided attention of the man you are calling. Without any preliminary conversation, you are right down to basic facts. Think also of conserving the time of the buyer."

Many such practical experiences have grown out of the Key Town Plan. As your business in the larger towns grows and takes more and more of your salesmen's time, why neglect the smaller towns? Keep up your contacts; cover them by telephone from the larger towns. The Bell System has prepared a national and regional Key Town Map, which may be procured free upon request to your local Bell business office.

Study these key town maps to learn the most effective method of reaching your market by telephone—the modern way to meet competition. Cover more towns. Make more contacts. Use classified telephone directories to uncover new outlets. Develop each territory with savings in cost.

The quickest way to make the calls from each key town is by Sequence Lists.

The Bell System Credit Plan makes it unnecessary to carry cash for the calls. It helps keep a record of all contacts.

Ask the local business office today for complete information. Bell Telephone Service . . . . *Quick* . . . . *Inexpensive* . . . . *Universal.*

AMERICAN TELEPHONE & TELEGRAPH CO. AND ASSOCIATED COMPANIES BELL SYSTEM

MORE-JONES QUALITY PRODUCTS

guished Service

More-Jones Armature Babbitt Metal

Back of the More-Jones reputation for service is a great organization embracing equipment and personnel that has contributed to the general betterment of the industry, and has solved many of the perplexing problems which have confronted its customers.

The company's plants, operated under chemical and physical laboratory control, produce the very finest quality of bronze bearings, castings, babbitt metals, and solders that can be obtained.

The personnel of the More-Jones organization is composed of many men of proven ability whose connections with it date back to the very beginning of electric railway transportation in America and earlier periods.

More-Jones Armature Babbitt Metal

No less than twenty-five different grades of Babbitt have been successfully perfected in the More-Jones line, designed for varying services and at varying prices. "Armature" for electric railway motor bearings is unexcelled for durability and economy.

More-Jones Trolley Wheels

This company is the largest manufacturer of trolley wheels in the world—one of our products perfected in cooperation with experts from various large electric railway systems.

"Tiger" Bronze Axle and Armature Bearings

Being one of the early achievements of More-Jones and probably the most widely known bronze on the market, the product has done much to establish More-Jones' name as one of the leaders in the manufacture of bearings.

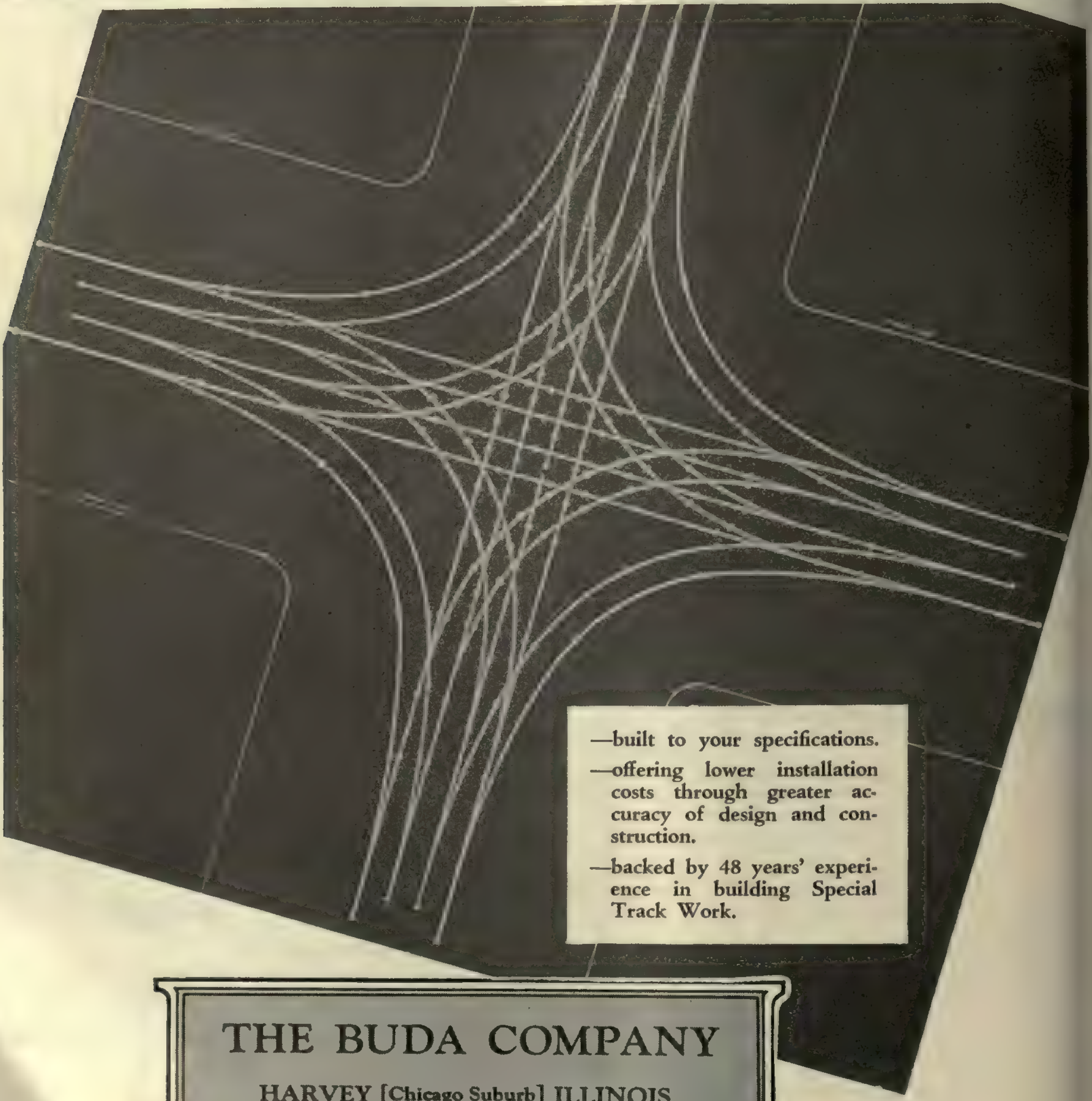
NATIONAL BEARING METALS CORPORATION
More-Jones Division
St. Louis, Mo.
New York, N. Y. Jersey City, N. J. Pittsburgh, Pa. Meadville, Pa.
Portsmouth, Va.

More-Jones Trolley Wheels

"Tiger" Bronze Axle and Armature Bearings

BUDA

SPECIAL TRACK WORK



—built to your specifications.

—offering lower installation costs through greater accuracy of design and construction.

—backed by 48 years' experience in building Special Track Work.

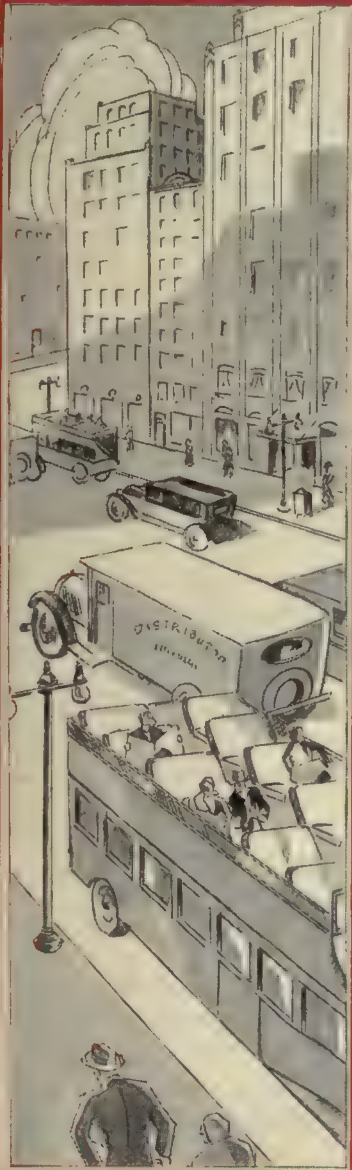
THE BUDA COMPANY

HARVEY [Chicago Suburb] ILLINOIS

NORTH EAST

Where Service is Hardest

In the field of bus transportation, where conditions are most severe, North East Equipment has long been recognized as the last word in dependability and long life. Its special fitness has been demonstrated over a period of years in the service of such organizations as:



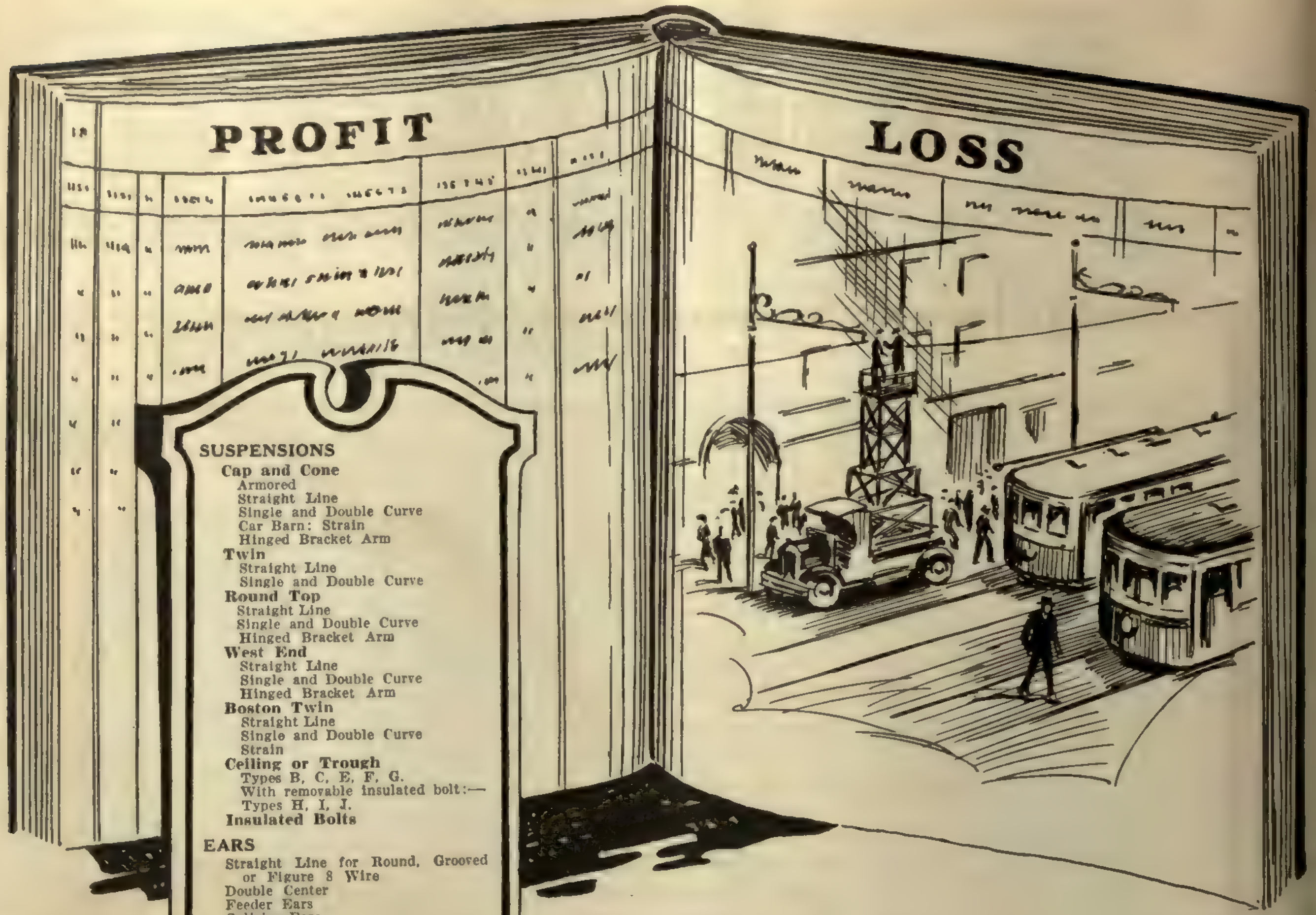
Fifth Avenue Motor Coach Co.
The Connecticut Company
Northland Transportation Co.
New England Transportation Co.
Indianapolis Street Railway Co.
Boston Elevated Railway Co.
Milwaukee Electric Railway
  & Light Co.
Royal Blue Line Co.
Third Avenue Railway System
Capitol District Transportation Co.
Winnipeg Electric Company
Toronto Transportation Co.
Municipal Tramways Trust
  of Adelaide, Australia
Omnibus de la Habana, Cuba
Wellington Municipal Tramways
  Corp. of New Zealand
Chicago Motor Coach Co.
Capital Traction Co.
Detroit Motor Bus Co.
Illinois Power & Light Co.
United Motor Coach Co.
Eastern Michigan Motor Buses
United Railways & Electric Co.
Pickwick Stages
Bridgeport Grey Line Bus Corp.
New York State Railways
Philadelphia Rural Transit Co.
DeCamp Bus Lines
Peoples Motor Bus Company
International Bus Corp.
Greyhound Lines
White Star Bus Line of Porto Rico

A new edition of Catalog 100-B, detailing the latest developments in North East Equipment for Motor Buses, is now ready.

NORTH EAST ELECTRIC CO.

ROCHESTER N.Y., U.S.A.

Service Stations all over the World



SUSPENSIONS
- **Cap and Cone**
  - Armored
  - Straight Line
  - Single and Double Curve
  - Car Barn: Strain
  - Hinged Bracket Arm
- **Twin**
  - Straight Line
  - Single and Double Curve
- **Round Top**
  - Straight Line
  - Single and Double Curve
  - Hinged Bracket Arm
- **West End**
  - Straight Line
  - Single and Double Curve
  - Hinged Bracket Arm
- **Boston Twin**
  - Straight Line
  - Single and Double Curve
  - Strain
- **Ceiling or Trough**
  - Types B, C, E, F, G.
  - With removable insulated bolt:—
  - Types H, I, J.
- **Insulated Bolts**

EARS
- Straight Line for Round, Grooved or Figure 8 Wire
- Double Center
- Feeder Ears
- Splicing Ears
- Half Strain
- Double Strain
- Clamp
- Mechanical
- Splicing Sleeves
- Feeder Cable Splicers
- Wire Connectors
- Strain Plates
- Wire Protecting Sleeves

FROGS
- Bronze
- Malleable Iron
- Two, four and six pull-offs
- In any degree, right and left hand
- High Speed
- With and without removable ears
- Frog wearing plates

CROSSINGS
- Bronze
- Malleable Iron
- Steel
- Insulated
- Uninsulated
- Adjustable
- Rigid
- With and without removable ears
- Overhead Conductor Bar Construction

YOKES
- Feed in
- Feeder Plug
- Straight Line
- Single and Double Curve
- Swivel Strain
- Double Trolley Wire

INSULATORS
- Wood Strain
- Elephant Strain
- Giant Strain
- Globe Strain
- Porcelain
- Feed Wire
- Feeder Tap
- Brooklyn
- Turnbuckle
- Third Rail Section
  - Single and Double Beam
  - Automatic
  - High Speed
- Split Spools
- Solid Spools
- Overhead material for Bridges
- Line Material for Cranes
- Sectionalizing Switches
- Trolley Wheels
- Sleet Wheels and Cutters
- Harps
- Pole Bands
- Eye Bolts
- Insulator Pins
- Tools for installing overhead material

Does line maintenance cost put your balance on the wrong side?

Hurrying crowds! A line down! Tied-up traffic! The loss of time, money and public goodwill!—often due to the use of obsolete or inefficient line material.

Properly to serve the public and to insure its co-operation and support, the policy of using modern material of recognized quality and durability must be adhered to. Where Anderson equipment is used, maintenance should be simplified and maximum service assured!

Backed by forty years of experience and development, *Anderson* engineers are prepared to serve railway companies in the solution of their overhead line material problems and to consult on the special requirements for local conditions.

Examine the accompanying partial list of *Anderson* equipment, select according to your requirements and write for quotations.

Send for the hundred page illustrated Bulletin No. 39

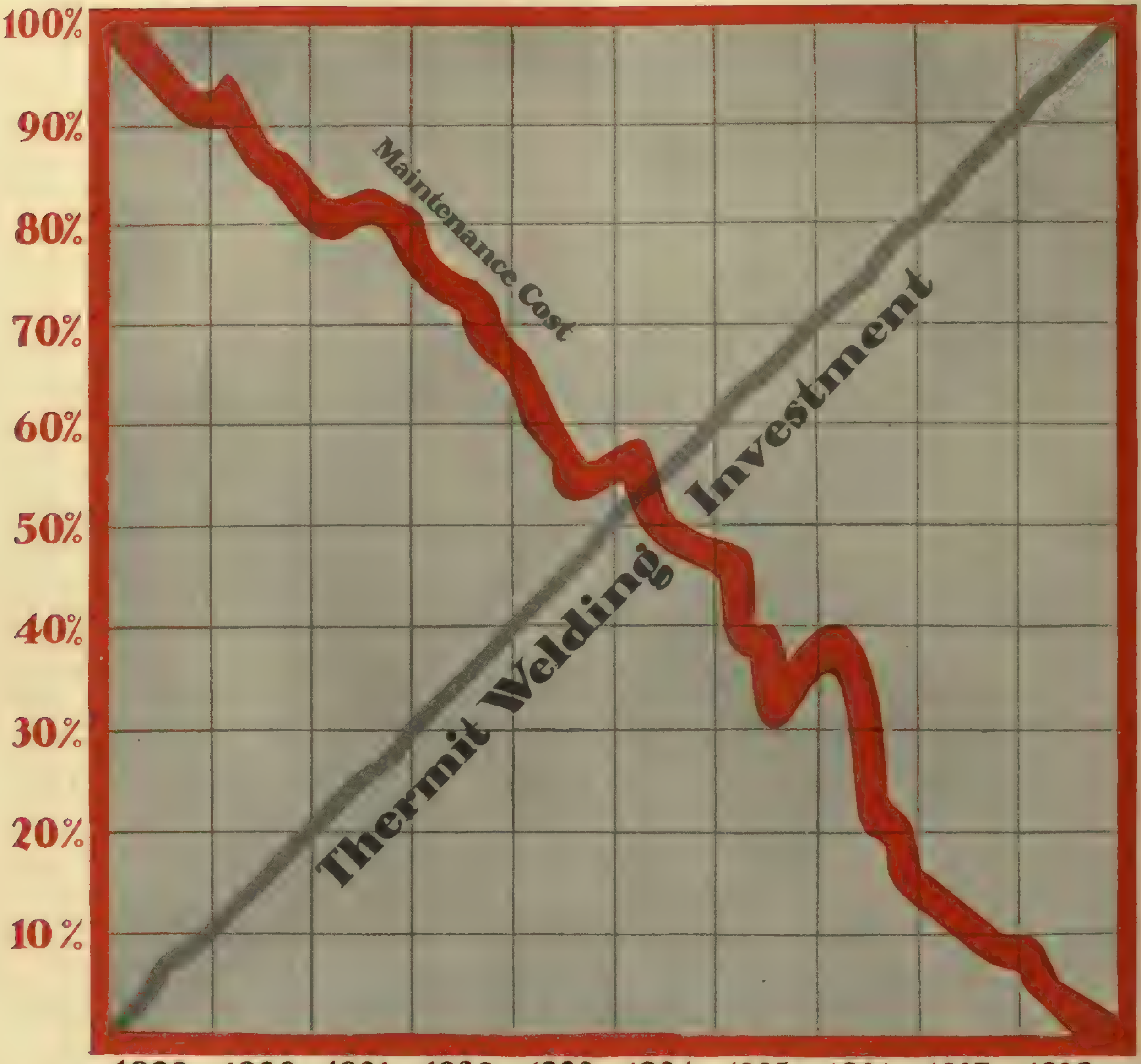
ALBERT & J. M. ANDERSON MFG. CO.
289-305 A ST., BOSTON, MASS.

PHILADELPHIA—129 Real Estate Trust Bldg.
CHICAGO—105 S. Dearborn St.
NEW YORK—135 Broadway
LONDON, E. C. 2, 12 Moor Lane

—dig and patch
—dig and patch!

You pay for
Thermit
whether you
use it . . . . . .
. . . . . . or not

Thermit Welds are a
Patched joints are a



As the Thermit curve goes up
track maintenance comes down

permanent investment
permanent expense!

176 joints to every mile of track, each one demanding its share of the yearly track repair appropriation — each one an item of expense. One remedy, but unfortunately the more expensive one is patching. The better method —and the cheaper one in the long run—is the permanent cure of Thermit welding. The little extra cost involved is an investment,—not only in better, smoother track,— but in protection against all future joint repair.

No matter how you figure it, you pay this extra cost whether you use Thermit or not. The only difference is that you pay it many times over if you patch.

Every railway company with Thermit equipment has first-hand proof of these facts. They know from actual experience that Thermit welds are free from future maintenance.

Start now a regular program toward jointless track. Make an appropriation to Thermit-weld a definite proportion of your existing rail joints during 1929, and each succeeding year. Then watch track maintenance costs head downward.

Smooth going and no future track expense!

Maintenance savings on track welded this year will pay next year's welding costs . . . . .

THERMIT

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

Pittsburgh Chicago Boston South San Francisco Toronto

Lay Track Economically— With Mass Production Methods

MASS PRODUCTION is largely responsible for industrial progress in the United States. Men are most profitably employed for the control and guidance of power.

Differential methods for laying and maintaining track are modern methods—the principle of mass production economically applied.

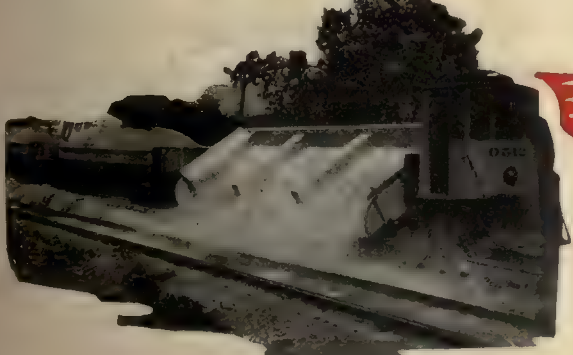
The Differential method is approved and employed by more than 65 electric railways. By its use transportation is improved, more riders are attracted to their lines, revenue is increased.

Let us explain the Differential method and show you actual savings made by representative railways. Write—

The Differential Steel Car Co.
FINDLAY, OHIO, U. S. A.

Differential Electric Locomotive Crane Car: Handles rails, special track work, ties, bridge timbers, poles, etc. Capacities: 5 tons at radii up to 26 ft., 2½ tons at radii up to 44 ft.

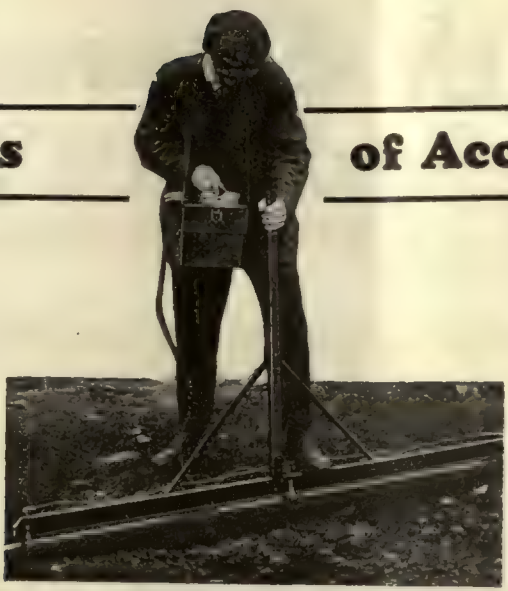
Clark Concrete Breaker: Breaks concrete at less than 2 cents per track foot. Protects man-holes, underground conduits, etc. Fast and economical.



Differential Electric Dump Car: Dumps either side — no labor required — places material clear of trench — load distributed as desired—material placed on job at gross cost of less than 2 cents per ton mile.

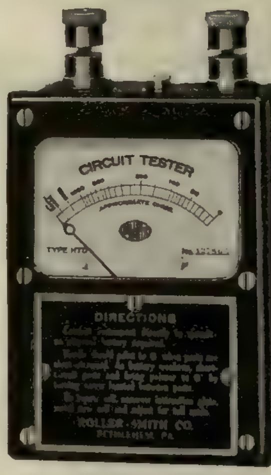
Differential Body. 3-way Dump: Dumps right, left, rear. Patented down-folding door slides load clear of wheels. Great in close quarters or when track is torn up.

Instruments of Accuracy



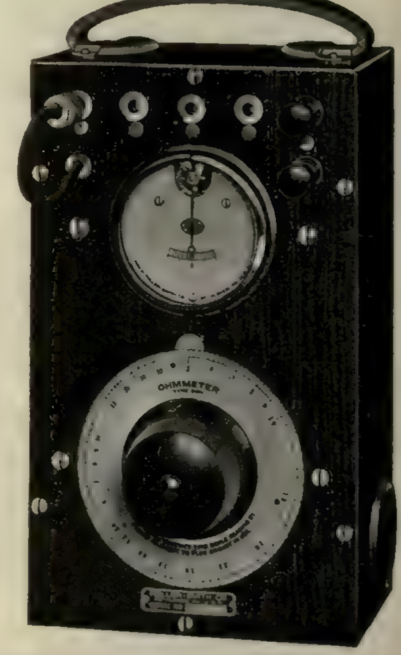
R-S Rail Bond Testers

Both types, SBT (standard sensitivity) and BBT (high sensitivity) are light, compact and portable. Not only are they easy to carry about but, also, they are easily read. The resistance of the bond can be read directly on the scale without involving any computation. ROLLER-SMITH Bond Testers are furnished with saw tooth contacts which bite through the surface scale on the rail head. Only one man is required to make quick, accurate readings with this equipment.



Type HTD Circuit Tester

This handy pocket size tester, operating on a self-contained, standard flash light battery is very useful for wiremen and repair men on coil and other electrical work, checking for continuity and resistance. The scale reads *directly* in ohms from zero to 10,000.



Type COM Ohmmeter

This instrument operates on two standard flash light cells. It is entirely self-contained and is designed especially for rapid measurement of coils and resistance units on a quantity basis. A quick connection adapter facilitates the handling of very small wires. Range is from .5 ohm to 50000 ohms. Resistances may be read to within 1% of their value.

SEND FOR BULLETINS C-200 AND C-300

Over 30 years' experience is back of ROLLER-SMITH

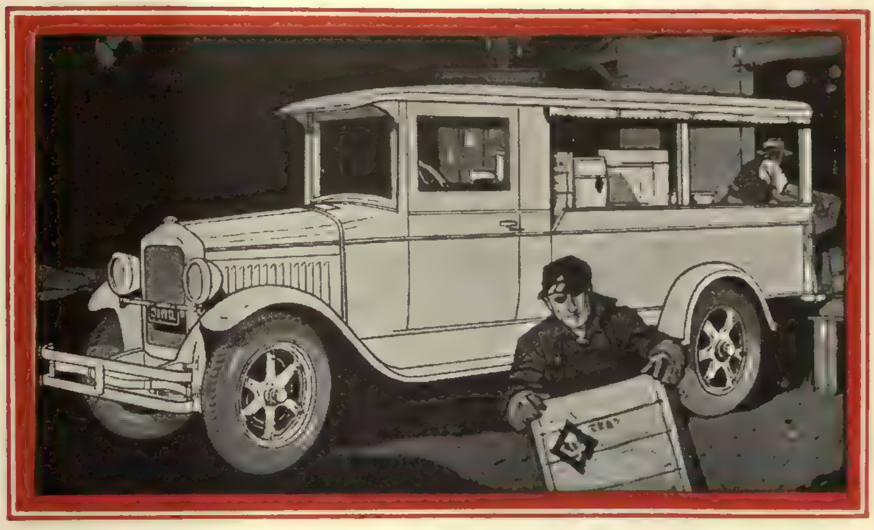
ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus

MAIN OFFICE
2140 Woolworth Bldg., NEW YORK

WORKS
Bethlehem, Penna.

Offices in principal cities in U. S. A. and Canada.
Representatives in Australia, Cuba, Philippine Islands and Japan.

The new WHITE SIX Light Duty Trucks



The new White Six Light Duty Trucks combine advanced style with complete driver comfort and practical utility. Available in a new range of color combinations. Chassis alone, including newest lighting and starting equipment, bumper, vacuum feed system, air cleaner, hot-spot manifold, rebound front spring plates, and complete equipment ready for body—$1850, f. o. b. Cleveland.

Built for the Modern Demands of *Speed and Economy* in Business

INCREASED business follows the policy of today's sales delivered today. The new Whites were built to make such service possible and have set up a new standard of values in the light delivery field. Conceived, engineered and built by White, the new light duty Sixes have a background of experience, resources and proved performance that cannot be attached to any other trucks of the same capacity rating.

Complete Traffic Mastery

In flexibility, ease of handling and acceleration the new Whites set a new record in truck performance. At sustained high speeds they travel all day with no trace of exertion. Top traffic speed is reached with surprising ease and diminished to a dead stop with the application of the positive 4-wheel hydraulic brakes.

In hundreds of businesses the new White Sixes will demonstrate an amazing reduction in operating costs and time—a new efficiency in transportation that means greater profits and service for the truck user.

THE NEW WHITE SIX LIGHT DUTY TRUCKS

White Built Throughout

The new Whites are built throughout in the vast White factory at Cleveland. They are notable examples of White's ability to pass on to users of transportation the benefits of the best engineering thought.

No matter what use you make of a truck, the new White Sixes offer advantages never before available in this field. On the basis of cost per package, per load, per eight hours of transportation service, there is no truck built that can do the job of the new Whites. The new Whites will prove economies and efficiency in your own operation that will amaze you. Call the nearest White Branch or Dealer.

Before You Buy Any Truck, See the New Whites Perform. You Will Be a Better Judge of Truck Values

We want you to see the new White Sixes and not take performance for granted. We want the new Whites to demonstrate to you a new kind of truck performance that is difficult to describe. Take advantage of this opportunity to learn first hand about the new Whites. We know there is nothing like them in the truck field today and a demonstration will prove every claim we make for them. Telephone the nearest White Factory Branch or Dealer for appointment.

THE WHITE COMPANY, CLEVELAND

LIGHT DUTY	
Light Delivery Chassis (6-cyl.)	$1850
1-Ton Chassis (4-cyl.)	1545
1¼-Ton Chassis (4-cyl. (Special)	2725
Light Duty Chassis (6-cyl.)	2450
1½-Ton Chassis (4-cyl.)	2125
HEAVY DUTY	
3-Ton Chassis (High Speed)	$4400
3½-Ton Chassis	4650
Heavy Duty Chassis	5100

WHITE
FOUR AND SIX CYLINDER TRUCKS AND BUSSES

FAST EXPRESS	
2 -Ton Chassis	$3125
2½-Ton Chassis	3750
BUSSES	
Model 53—4-cyl., 16-pass.	$4250
Model 50-B—4-cyl., 25-pass.	5350
Model 54—6-cyl., 29-pass.	7500
Model 54-A—6-cyl., 39-pass.	8000

ALL PRICES LISTED ABOVE ARE FOR CHASSIS ONLY — F. O. B. CLEVELAND

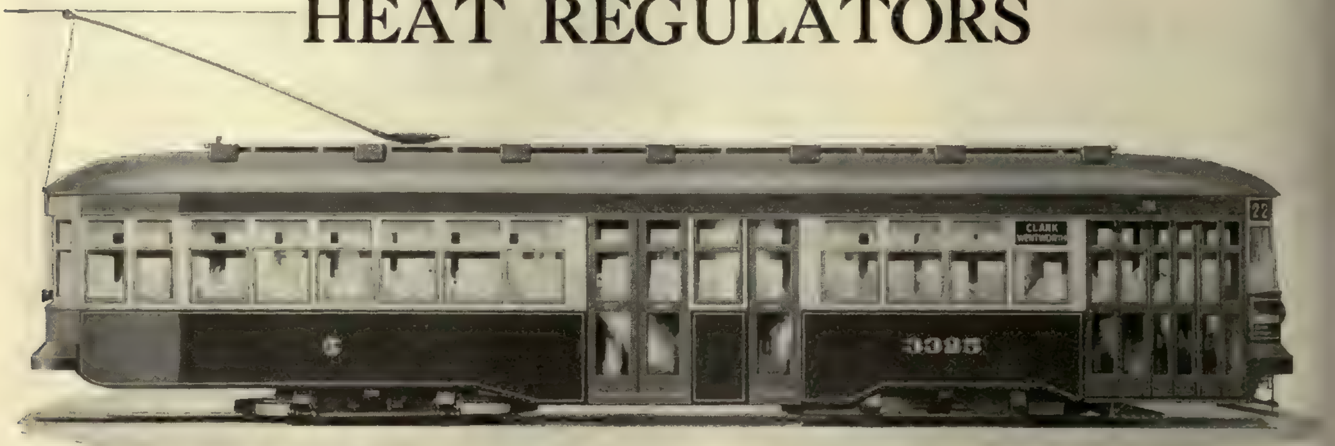
Comfort assured

on Chicago's 100 New Cars

with UTILITY

HEATERS, VENTILATORS and

HEAT REGULATORS



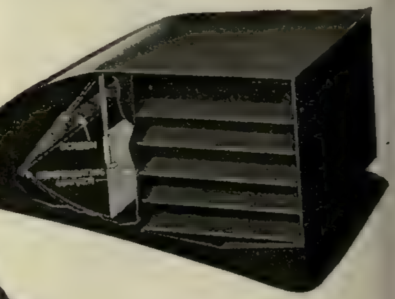
This is Not an Experiment

There are more than **100,000 Utility Chromalox Enclosed Heaters** in operation on 600 to 1500 volts, giving entire satisfaction. **Every Heater Carries the Underwriters' Label.**

The **Utility Compensating System of Natural Ventilation** has met the most stringent ordinance requirement ever prescribed by any municipality in the country, and after rigorous service tests was universally adopted by the Chicago Surface Lines in 1916.

The **Heat Regulators** keep the air in the cars at uniform temperature and avoid the spread of contagious disease by preventing overheating the cars.

Thermostat



Intake Ventilator

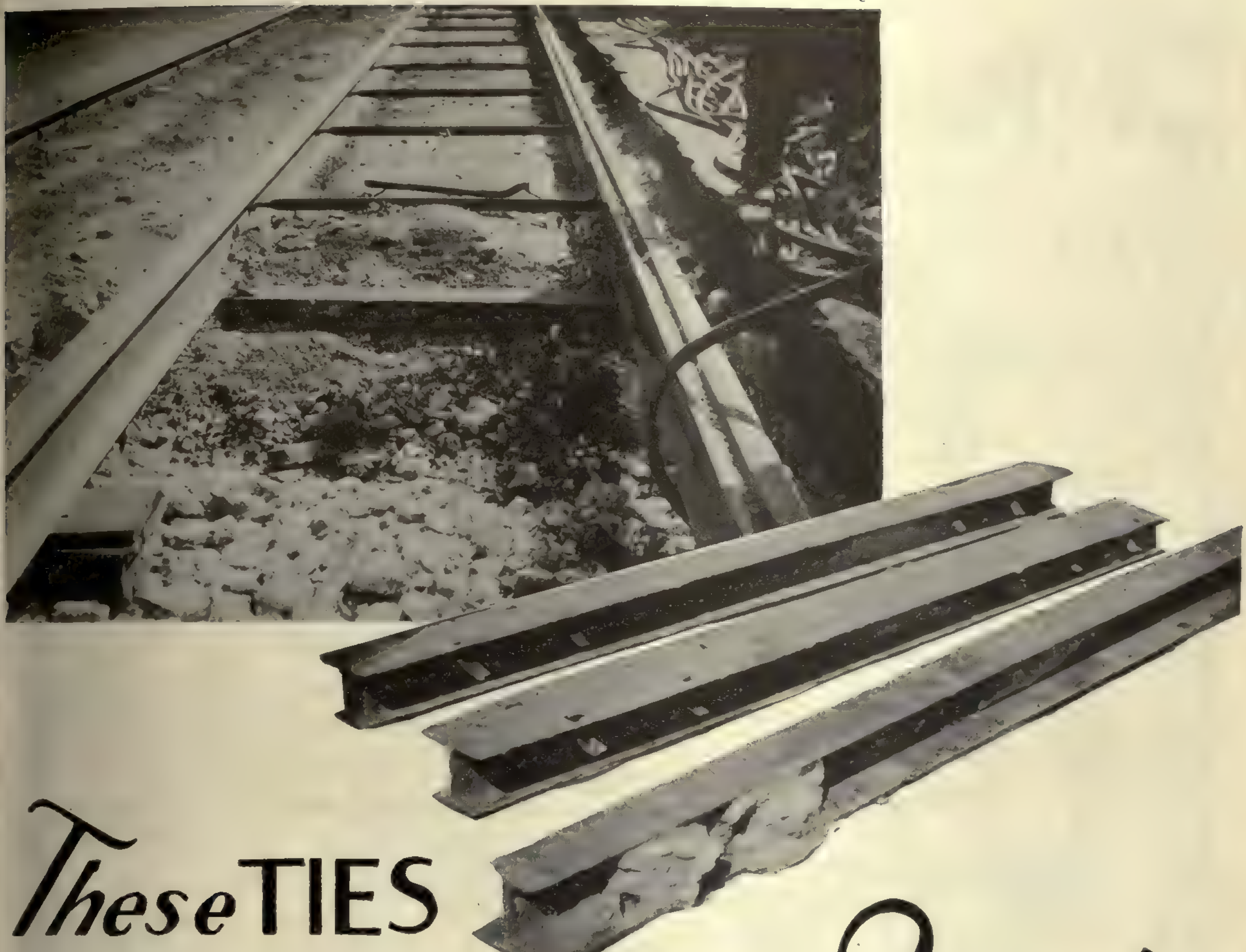
Cross Seat Electric Heater, fitted with Chromalox Strips. Listed as Standard by Underwriters' Laboratories. Delivers 100 per cent output for electric energy input.

Exhaust Ventilator

Write us. Let us tell you in detail the further advantages of Utility Equipment.

RAILWAY UTILITY COMPANY

2241 TO 2247 INDIANA AVE. CHICAGO, ILLINOIS



These TIES Answer Yes!

Does it pay to use steel ties in track construction? The Carnegie Steel Cross Ties pictured above are old enough to vote and will add their voice to the affirmative. In 1907 they were laid in the tracks of the Chicago Surface Lines. Recently uncovered, it was decided to rerail the ties inasmuch as they were in such splendid condition. Twenty-two years of service and still going strong!

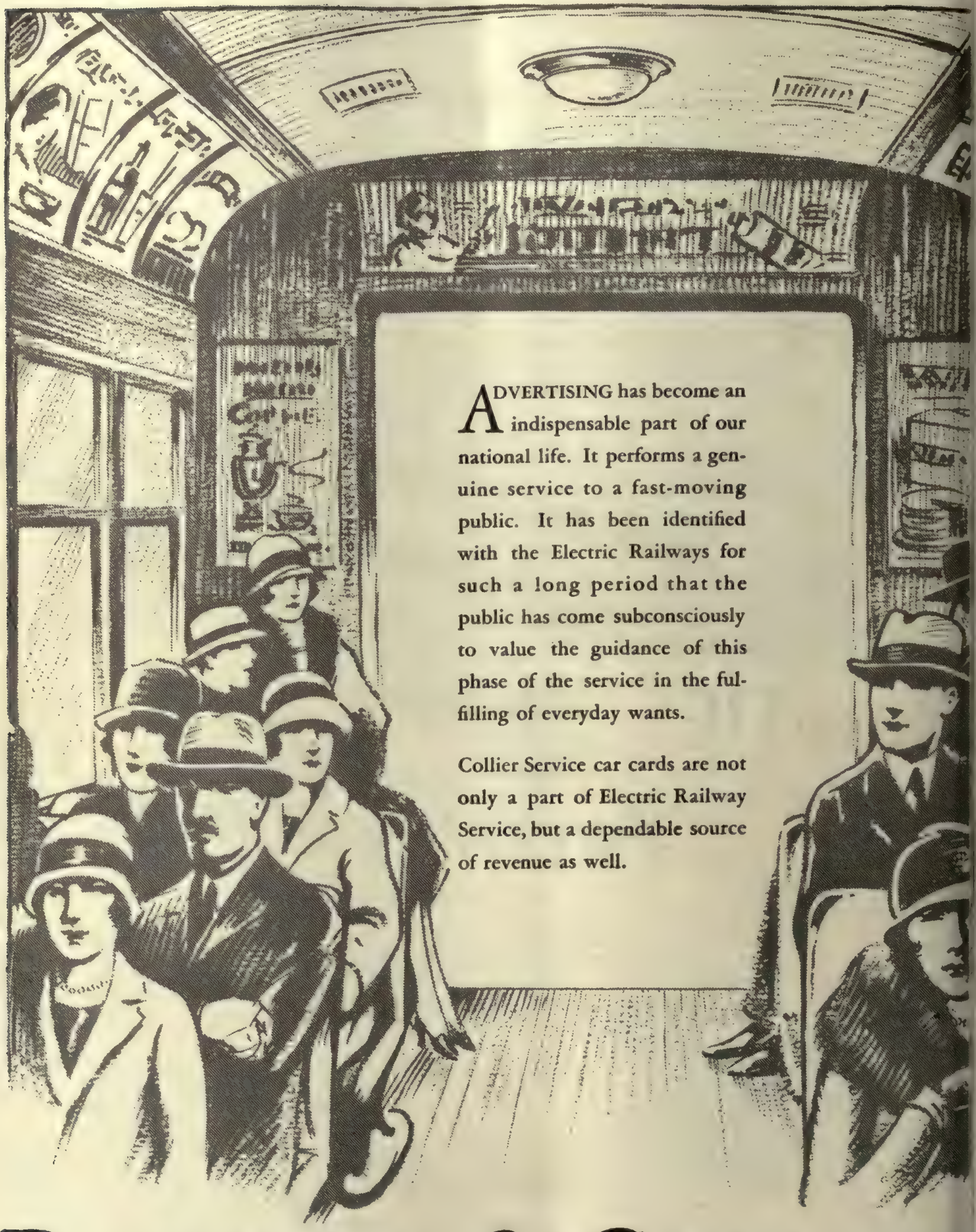
Yes! It pays to use Carnegie Steel Cross Ties. Nor is long service their only dividend. They provide a track that is free from interruptions for track repairs—a smooth track on which your passengers ride swiftly, safely and comfortably. Passenger appeal starts with the track. A poor track not only offsets the advantages of luxurious rolling equipment, but hastens it to a premature discard. In your 1929 track construction program, plan to include Carnegie Steel Cross Ties—an investment that pays dividends.

Booklet on Request.

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION

CARNEGIE BUILDING—PITTSBURGH, PA.



ADVERTISING has become an indispensable part of our national life. It performs a genuine service to a fast-moving public. It has been identified with the Electric Railways for such a long period that the public has come subconsciously to value the guidance of this phase of the service in the fulfilling of everyday wants.

Collier Service car cards are not only a part of Electric Railway Service, but a dependable source of revenue as well.

BARRON G. COLLIER
INC

CANDLER BLDG. — NEW YORK CITY

Car Card Advertising Almost Everywhere

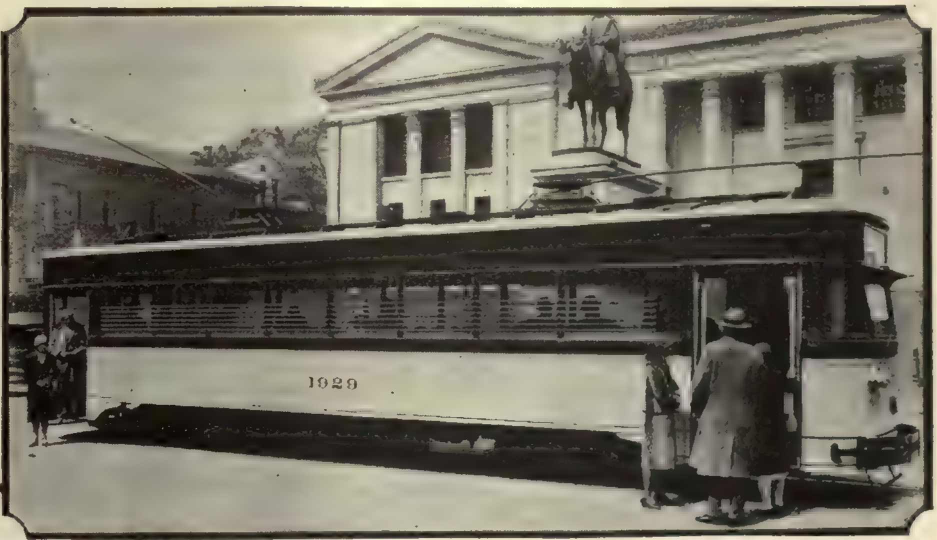
The Osgood Bradley 1929 Model

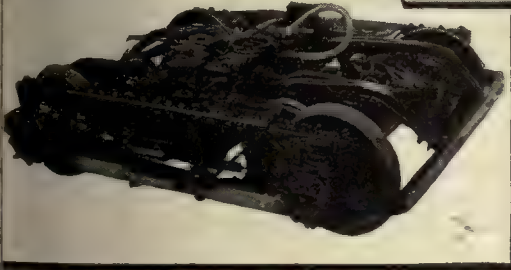
Hyatt Equipped

ON all modern street cars, anti-friction journal bearings are standard equipment, and Hyatt Roller Bearings a favorite among the equipment builders.

That is why the Osgood Bradley Car Company placed Hyatt Roller Bearing Journal Boxes under their 1929 model, which is the "last word" in up-to-date car construction.

The car illustrated is the one you undoubtedly saw at the last A.E.R.A. Convention. Duplicates of this car are already in operation at different points, and are giving a splendid account of themselves. Below, their truck, showing the application of Hyatt Journal Boxes.





The railways of America are fast realizing that modern equipment is the way to combat competition, build public good will, and sell more rides.

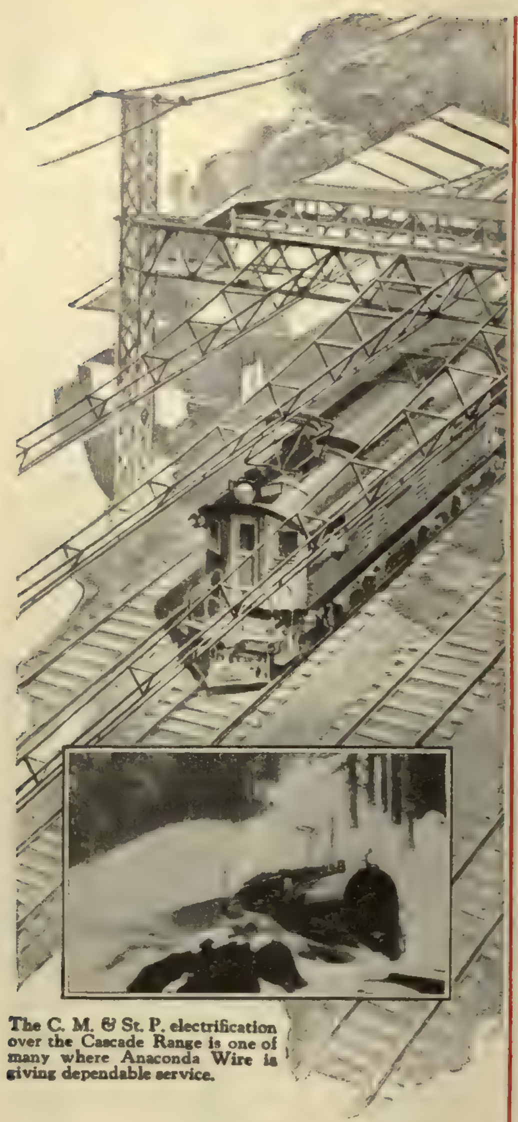
With Hyatt Roller Bearing Journal Boxes more comfortable riding is made possible. However, this is but one of their many advantages, for in addition they effect worthwhile operating economies —savings in power, maintenance, and shoppings.

Whichever way you figure it, Hyatt Roller Bearings soon pay for themselves, and then go on many years earning profits on the investment.

The Osgood Bradley Car Company, in equipping their new cars with Hyatt Roller Bearings, when so specified, are offering you modern cars with modern bearings. Investigate.

HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS



The C. M. & St. P. electrification over the Cascade Range is one of many where Anaconda Wire is giving dependable service.

ANACONDA
from mine to consumer

Six wire mills offer a coast-to-coast service unequalled in promptness and dependability.

A Technical Department is maintained to assist electrical engineers in the adaptation of copper and copper alloys to specific requirements. You are invited to make use of this service.

ANACONDA
TROLLEY WIRE

for every
Transportation Requirement

Anaconda Trolley Wires are made in round, grooved and figure-8 sections and in the following grades:

HITENSO "C" **(*Copper-Cadmium alloy*)**
An exclusively Anaconda product combining high tensile strength and the utmost wearing quality with the least sacrifice in conductivity. Meets the physical requirements of the A. S. T. M. specifications for *High* Strength Bronze and exceeds the required conductivity by 15%.

HITENSO "A" **(*Copper-Cadmium alloy*)**
This Anaconda product embodies the same general characteristics as Hitenso "C". It meets the strength requirements of A.S.T.M. specifications for *Medium* Strength Bronze but exceeds the required conductivity by 15%.

Hitenso Trolley Wires are recommended not only because their conductivity is higher than that of Tin-Bronzes of equivalent strength, but also because they do not become brittle when overheated by short-circuits—a recognized characteristic of Tin Bronze alloys.

HARD DRAWN COPPER
Is recommended for normal service conditions where traffic is not heavy. This product is made from Anaconda Electrolytic Copper guaranteed 99.9% pure.

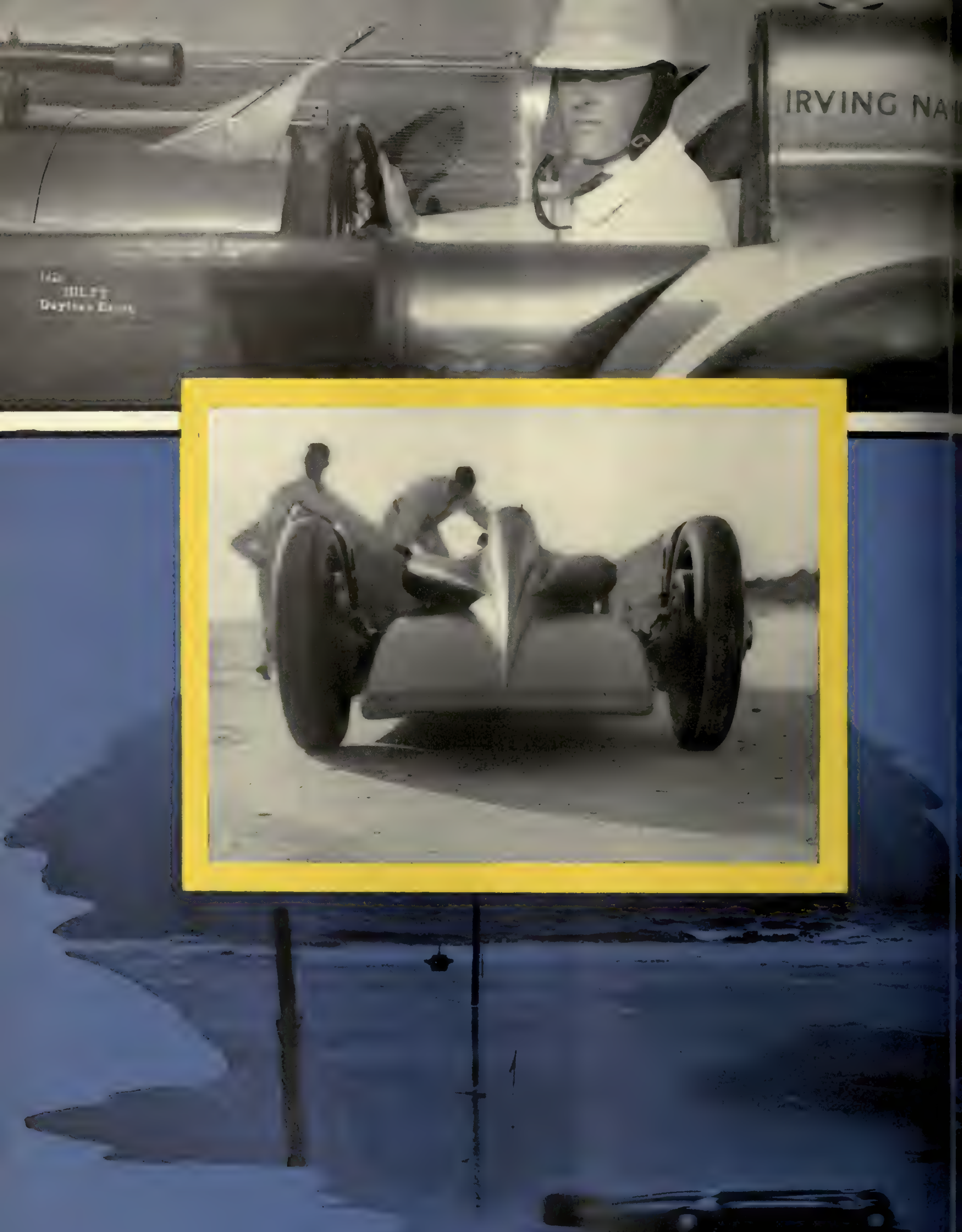
MEDIUM and HIGH STRENGTH BRONZES
Anaconda Tin-Bronze Trolley Wires can be manufactured to meet the A.S.T.M. Specifications B-9-25T, also the specifications recommended by the A.E.R.A.

For detailed information on Anaconda Trolley Wires, write for Publication B-11.

ANACONDA COPPER MINING CO.
THE AMERICAN BRASS COMPANY
Rod, Wire and Cable Products
General Offices: 25 Broadway, New York
Chicago Office: 111 West Washington Street

ANACONDA WIRE PRODUCTS

one champion
to another



Major H. O. D. Segrave, of England, drove 231.36 [illegible] hour on the ocean beach at Dayton[illegible] March 11, 1929, using a 12-cyl[illegible] Napier special car of his [illegible] world record for [illegible]

The fastest human sought comfort!

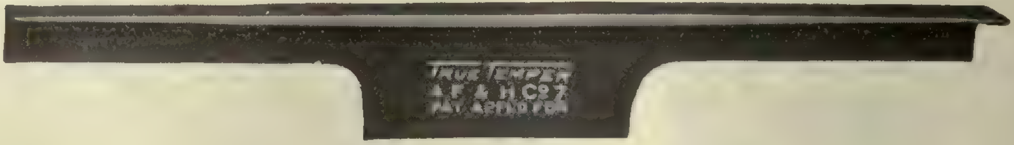
"In my opinion the principles of the Twin Coach by which the total road area is utilized for carrying passengers is an advance in coach construction over common practices. The road ability and public utility faculties are excellent in this vehicle. I was surprised at its speed."

Major H. O. D. Segrave

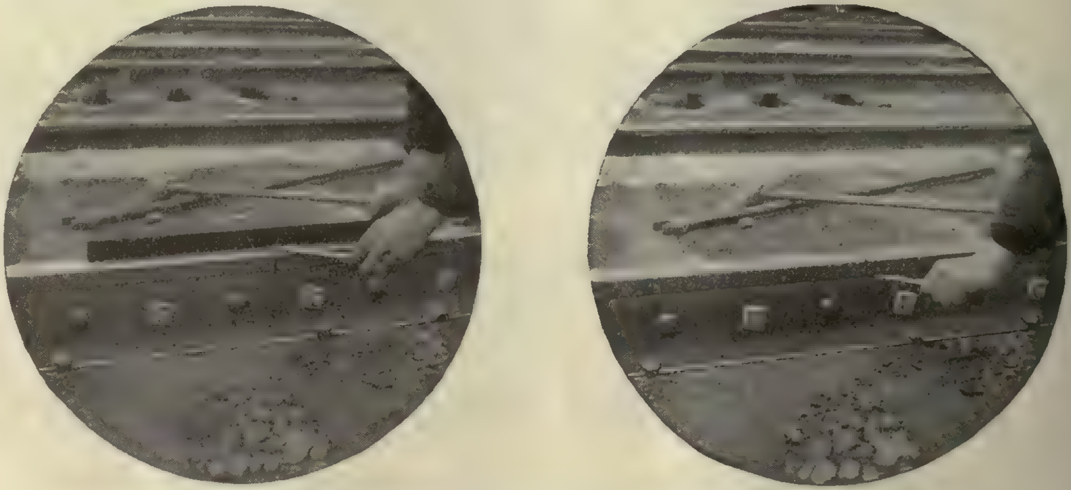
Miami Beach, Florida
March 20, 1929

During his leisure hours in Florida, Major Segrave used a Twin Coach Parlor Car for the recreation purposes of himself and English party, repeatedly expressing his frank admiration of the capacity of the latest Twin Coach motors with their multiple cylinders and dual drive arrangement.

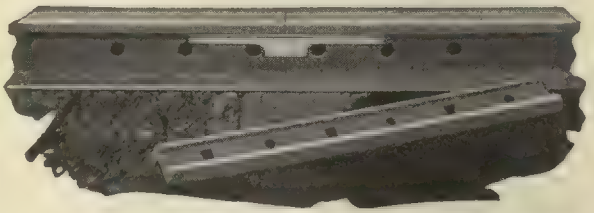
TRUE TEMPER TAPERED RAIL JOINT SHIM



The Remedy for low joints caused by wear



Low Joint conditions quickly and economically corrected by application of True Temper Tapered Rail Joint Shim



True Temper Tapered Shim in position with angle bar removed

Shim shown in position between rails and angle bar

The American Fork & Hoe Company

General Offices: Cleveland, O. *Factory:* North Girard, Pa.

District Offices
Whitehall Bldg., New York, N. Y.—Railway Exchange Bldg., Chicago, Ill.

Representatives at
Boston, Detroit, Minneapolis, St. Louis and San Francisco

Foreign Representatives
Wonham, Inc., 44 Whitehall St., New York, N. Y.; and 68-72 Windsor House, Victoria St., London, S.W.-1

GUARDIANS of Quality IN MODERN VECHICLES & MACHINERY

AS GUARDIANS of quality in modern vehicles and machinery, none take higher rank than bronze bearings. None have more vital functions to perform.

How essential then that these important integral parts be carefully manufactured from high quality metal of the proper mixture. How costly if they fail to execute properly their necessary duties.

No wonder the job of producing these bronze products is being turned over to the specialized manufacturer. It is the way to insure uniform high quality and at the same time lower unit costs.

At Johnson Bronze your bronze bearing problem will get the kind of consideration to which it is entitled—sensible, sane and in keeping with modern engineering practice. And when you deal with Johnson Bronze you are assured of a level of prices made possible only by the world's largest production of such products.

JOHNSON BRONZE CO., New Castle, Pa.
New York, Chicago, Detroit, Cleveland, Philadelphia, Kansas City, San Francisco

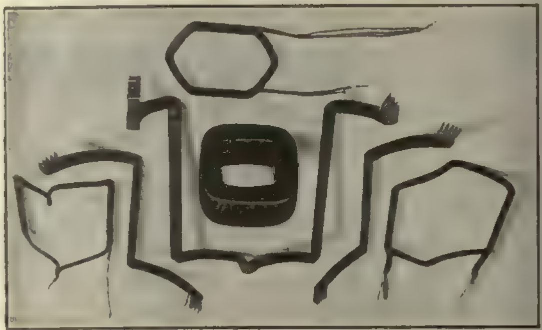
Write for a copy of this handy Wall Card which lists over 600 "in stock" sizes ready for immediate delivery.

JOHNSON BRONZE

BUSHINGS BEARINGS BAR BRONZE

COLUMBIA

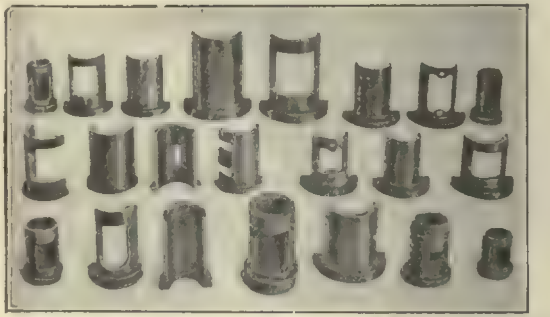
This Equalizer Bar and Brake Rigging are good examples of Columbia Heavy Forgings. Our complete equipment enables us to provide a wide variety of light and heavy forgings. Send us your blue prints and specifications.



Only the best grade of double cotton covered magnet wire, moulded or pressed to accurate slot dimensions, is used in the making of Columbia Armature and Field Coils.

QUALITY

RAILWAY and UTILITY SUPPLIES.
FORGINGS, SPECIAL MACHINERY and PATTERNS.
CASTINGS—ALUMINUM, BRASS and GREY IRON.
MACHINE and SHEET METAL WORK.
ARMATURE and FIELD COILS.

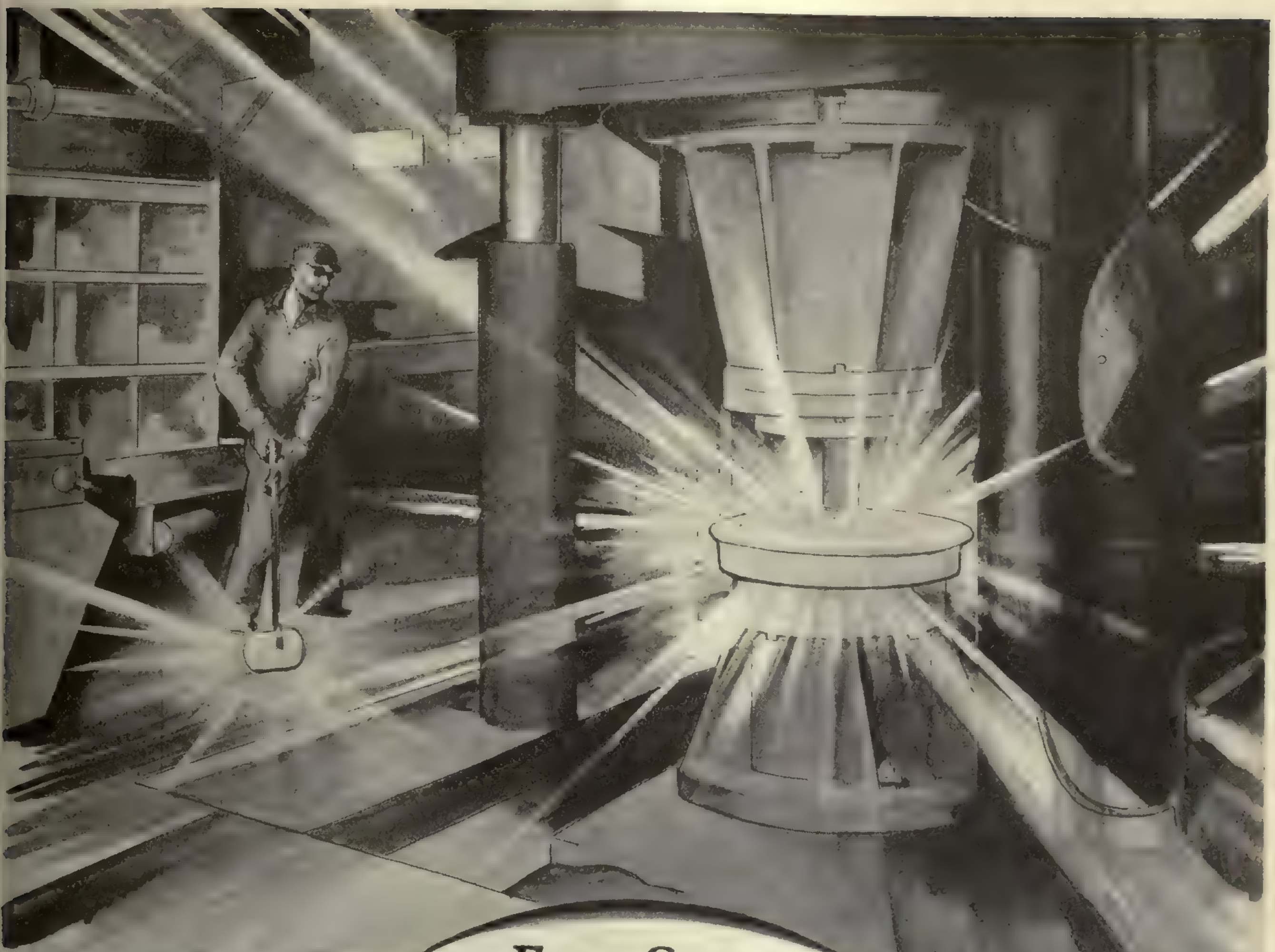


Columbia No. 1—an especially developed bearing bronze—gives Columbia Armature, Axle and Journal Bearings the long wearing qualities that have made them standard equipment on many of the leading roads.

Columbia Trolley Wheels, Poles and Harps combine the essentials of ample conductivity, with proper hardness for minimum wear on wire and maximum wheel mileage. Poles and Harps are light, yet strong and dependable.

COLUMBIA MACHINE WORKS & M. I. CO.

265 Chestnut Street, Corner of Atlantic Avenue
BROOKLYN, NEW YORK



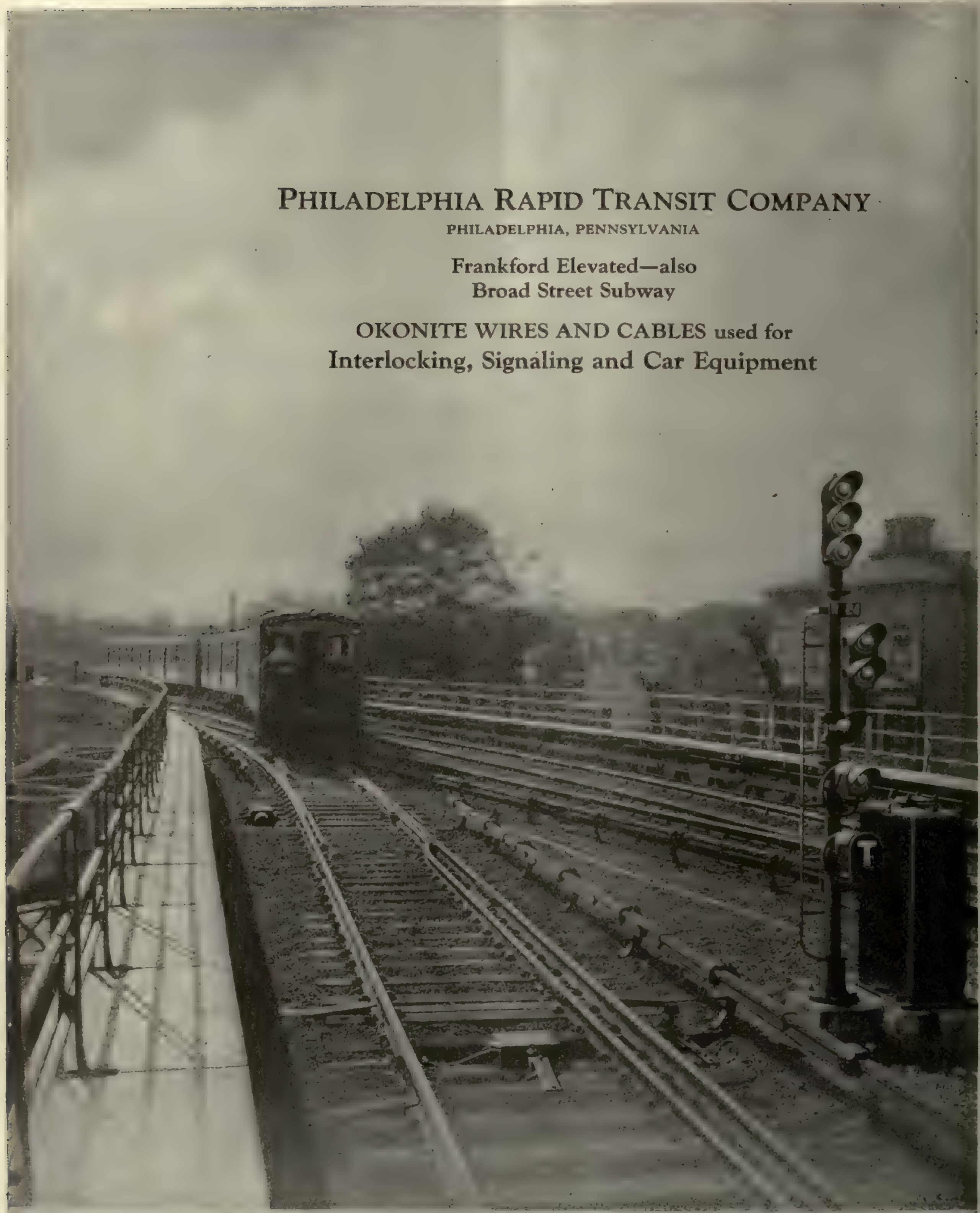
Every Stage
A Step to Multiplied Mileage

The principal object of the operation pictured above is to remove from the center of the hub of a Gary Wheel Blank a cylinder of steel concentric with the vertical axis of the ingot from which it was made. The object is accomplished by placing the blank in a centering die and pressing through it a punching die. . . . . . This is just one of many stages in the journey that leads from wheel blank to shipping dock. . . Each is carefully designed according to most modern practice. . . Each makes use of long experience and equipment kept at maximum efficiency by constant inspection and maintenance. . . Each contributes its part to multiplied mileage.

Our wheel engineers are at your service.

Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices:
208 South La Salle Street, Chicago

G A R Y
WROUGHT STEEL WHEELS



PHILADELPHIA RAPID TRANSIT COMPANY
PHILADELPHIA, PENNSYLVANIA

Frankford Elevated—also
Broad Street Subway

OKONITE WIRES AND CABLES used for
Interlocking, Signaling and Car Equipment

THE OKONITE COMPANY

THE OKONITE-CALLENDER CABLE COMPANY, Inc.

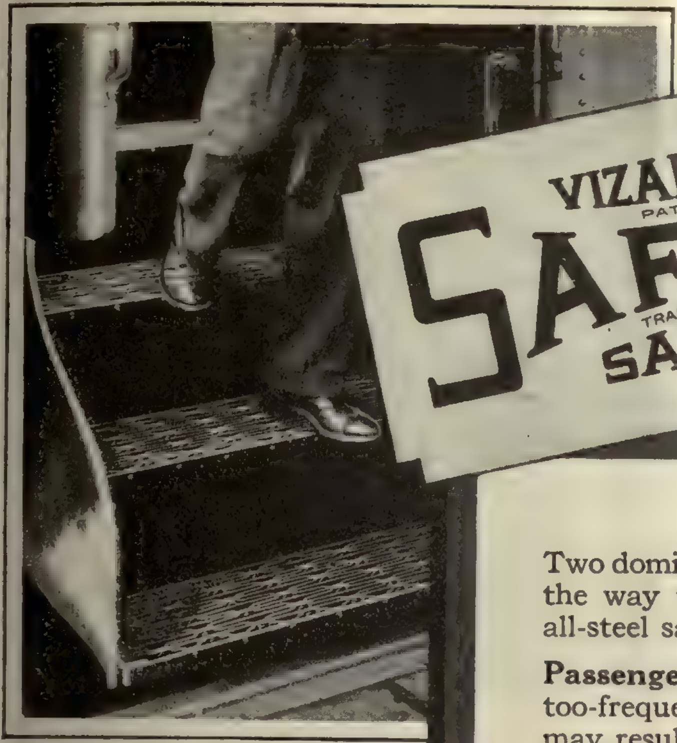
Factories: Passaic, N. J. Paterson, N. J.

SALES OFFICES: NEW YORK CHICAGO PITTSBURGH ST. LOUIS
ATLANTA BIRMINGHAM SAN FRANCISCO LOS ANGELES BOSTON
SEATTLE DALLAS

OKONITE

Novelty Electric Co., Philadelphia, Pa. F. D. Lawrence Electric Co., Cincinnati, O.
Canadian Representatives: Engineering Materials Limited, Montreal
Cuban Representatives: Victor G. Mendoza Co., Havana

OKONITE-CALLENDER



VIZABLEDG
PATENTED
SAFKAR
TRADE MARK REG.
SAFSTEP

Two dominating considerations point the way to your adoption of these all-steel safety steps:

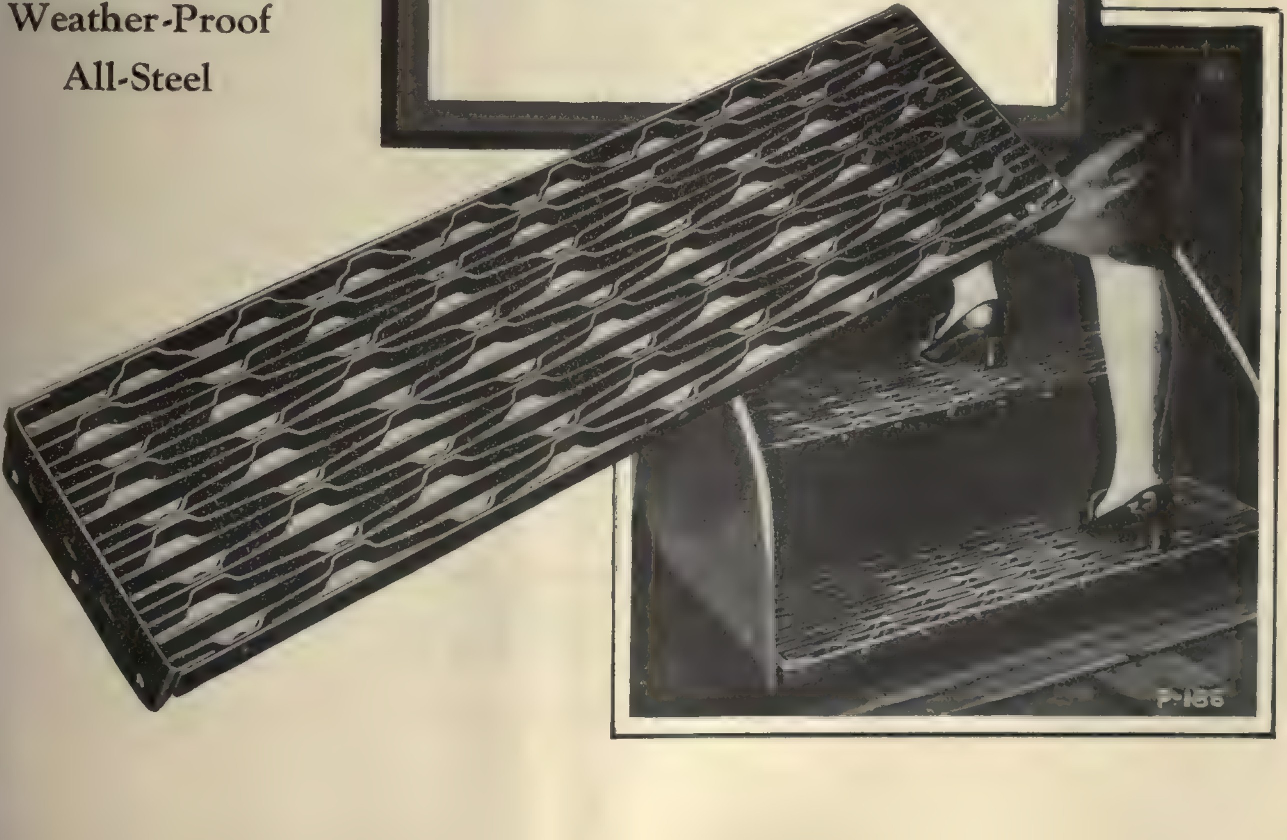
Passenger Safety against the all-too-frequent "step accidents" which may result in costly damage claims.

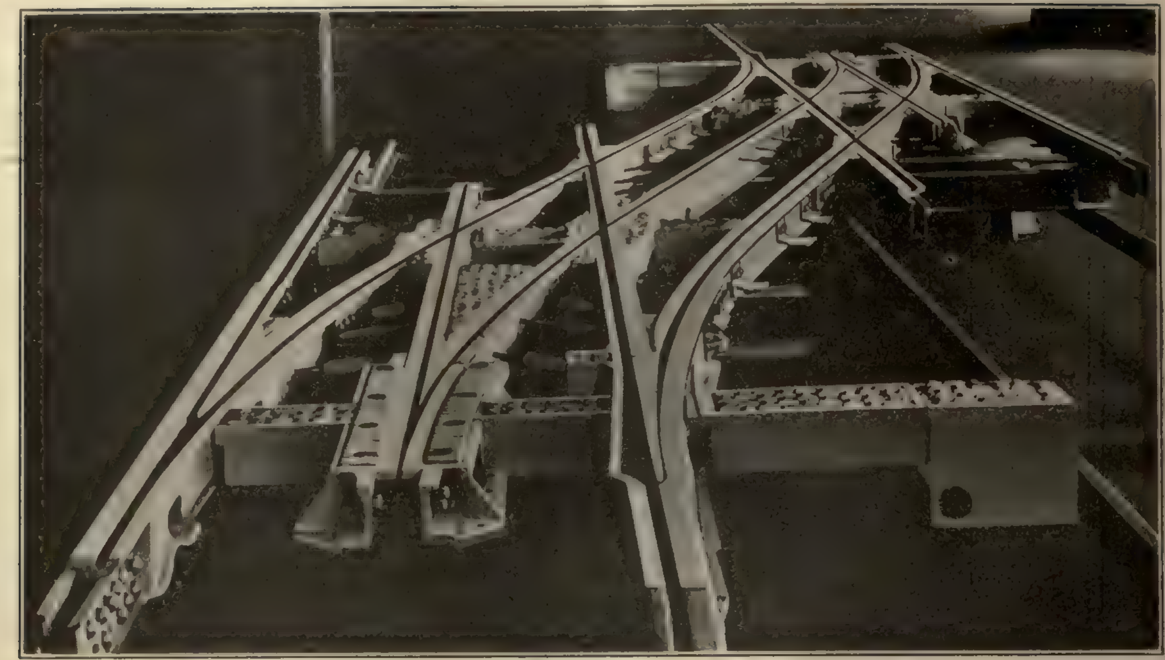
Operating Economy resulting from the elimination of all car step maintenance and a lower cost of car cleaning.

Let us send Bulletin 2D28.

IRVING IRON WORKS CO.
LONG ISLAND CITY, N.Y. U.S A.
Established in 1902
SALES OFFICES IN ALL PRINCIPAL CITIES
See Your Telephone Book for Local Address

Slip-Proof
Miss-Proof
Self-Cleaning
Time-Proof
Weather-Proof
All-Steel





Your cars are on the right track if the TRACKWORK is TISCO

PRESENT-DAY trackwork is called on to bear an ever-increasing burden—and it *must* stand up for on it depends the flow of traffic and the safety of passengers. *One* failure means an expensive tie-up and time, money and public confidence lost.

This company has concentrated on the problem of trackwork for frogs, switches, crossovers and crossings and offers you TISCO trackwork which will stand up under all present-day traffic conditions.

We can furnish also, trackwork of Chrome Nickel Construction, if desired.

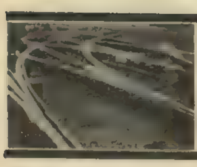
TISCO

MANGANESE STEEL

—The Original in the Trackwork Field—gives super-enduring qualities to frogs, switches, crossovers and other special trackwork.

WM. WHARTON JR. & CO., *Inc.*

EASTON, PA.



TISCO TRACKWORK *for Frogs, Switches, Crossovers, Crossings*

ow
osts—

ood Looks

ore
requent Service

DB

Your Investment
is Certain wit

DODGE
BROTHERS

CHRYSLER MOTORS PRODUCT

DODGE
MOTO

SOLD BY DODGE BROTH

afe, Your Return
odge Motor Coaches

They pay out for Operators everywhere in mile after mile of fast, safe, dependable service.

There is no guess, no experiment about Dodge Brothers Motor Coaches . . . . . For years they have been paying to increasing thousands of owners a high return on a small investment—in passengers carried, in schedules maintained, in dollars saved and in dollars earned.

Correct in each fine detail of design and workmanship, built for passenger transportation and honestly priced, Dodge Brothers Motor Coaches are dependable always . . . . . powerful, fast, economical, comfortable, safe, good-looking.

The 21-passenger street car type coach is favored by hundreds of operators who realize the importance of great frequency of service with low operating cost.

Owners say of the Dodge—"Everything a motor coach should be or have." Have a transportation talk with your Dodge Brothers Dealer—or write direct to Detroit.

BROTHERS
OACHES

EALERS EVERYWHERE

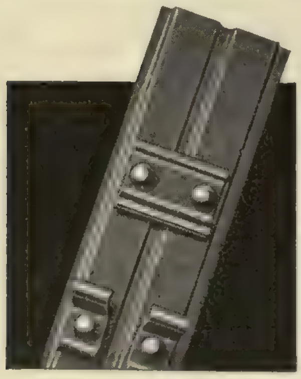
Photograph at left shows the large saving in excavation when track is laid with Bethlehem No. 3 Steel Ties.

Photograph below shows laying and finishing concrete 12 in. deep on double-track construction job, in which Bethlehem No. 3 Steel Ties were used.

These Steel Ties

Reduce Construction Costs

Bethlehem No. 3 Steel Ties offer many advantages in electric railway track construction. These ties cost less than wood ties, speed up construction, and stand up under heavy vehicular and rail traffic. Substantial savings in installation costs are to be had, because of the low first cost of Bethlehem No. 3 Ties and the simplicity of track laying when they are used.



Bethlehem No. 3 Steel Tie, showing the two movable clips and stationary clip which form a strong, rigid rail fastening.

Considerably less excavation is necessary with Bethlehem No. 3 Steel Ties, and there is a corresponding reduction in the amount of concrete used, and in the labor required. Estimates of the cost of construction compared with conventional practice indicate savings of more than 30 per cent when track is laid with these ties. In addition, due to the shallow, compact section, the Bethlehem No. 3 Steel Tie reduces the cost of handling, distributing, and fastening to the rails.

The Bethlehem No. 3 Steel Tie is made in one piece; the tie is complete in itself, and is made to fit any gage of track. There are no extra parts to become lost or mislaid. It is shipped with locking clips open, and because there are no other parts needed, the tie is ready for immediate installation—all that is required is to drive the locking clips into position with a hammer. Bethlehem No. 3 Ties are rugged in construction and give years of service under severe traffic conditions.

Write for illustrated bulletin explaining more in detail the advantages and economies of Bethlehem No. 3 Steel Ties in electric railway track construction.

BETHLEHEM STEEL COMPANY, General Offices: Bethlehem, Pa.

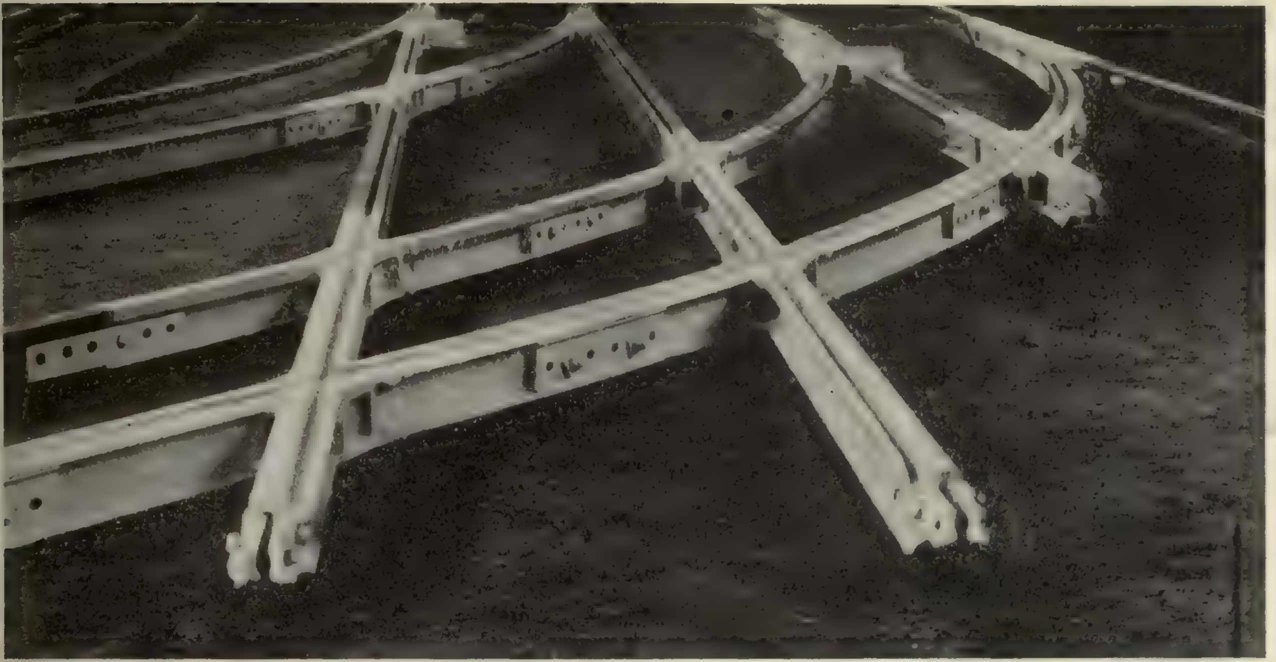
District Offices:

New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland and Honolulu.

Bethlehem Steel Export Corporation, New York, Sole Exporter of our Commercial Products

BETHLEHEM

Wear-Resisting! Weldable!



Bethlehem Welded Turnout and Crossover, made of silico-manganese steel.

Silico-Manganese Special Trackwork

The shock- and wear-resisting properties of silico-manganese steel are well established. This material has already been accepted as standard for highest grade automobile springs and other parts subject to shock and wear, as well as for high grade tools such as punches, chisels, shear blades, etc.

In the manufacture of special trackwork, Bethlehem uses silico-manganese steel of tool steel quality, that is hard enough to resist wear, yet sufficiently tough to withstand violent shocks and pounding. In addition the silico-manganese steel castings can be readily welded, and built up in the field.

Bethlehem Welded Special Trackwork—called Design No. 999—combines solid, one-piece construction with virtually all the desirable features of the best previously-used forms. In addition it has the decided advantage of being easily repaired by welding. This new welded special work is recommended for your 1929 requirements.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.

DISTRICT OFFICES: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

Bethlehem Steel Export Corporation, 25 Broadway, New York City. Sole Exporter of our Commercial Products.

BETHLEHEM

Increase 1929 Earnings, with Sullivan Air Power

Sullivan Portable Compressor and Sullivan Busters removing concrete for the Mobile Light and Railroad Company, Mobile, Alabama.

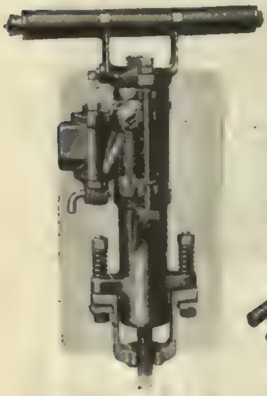
Make Track Maintenance

Quicker and Cheaper

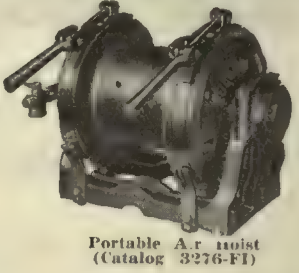
SULLIVAN PORTABLE AIR COMPRESSORS will speed up construction and repair work on the track. They are trouble-free because they are built to run without vibration.

The electric motor-driven 103 and 206-ft. compressors were designed especially for electric railway service, can be connected anywhere, and are good for 100 lbs. pressure. Mountings are steel wheels, rubber-tired trailer trucks, or skids ready for mounting on motor truck. Gasoline models are also available.

The 103-ft. compressor will run a concrete breaker, two tampers, four riveters, four clay diggers, or a rock drill. *Catalog 3283-F.*



39-lb. Rock Drill (Catalog 3281-S)



Portable Air Hoist (Catalog 3276-FI)

SULLIVAN CONCRETE BREAKERS, ROCK DRILLS, AND CLAY SPADERS are convenient air tools for removing concrete, rock, and hard clay. Numerous models can be furnished for a variety of work. *Send for Catalogs.*

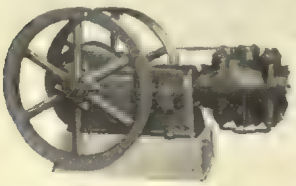
SULLIVAN PORTABLE HOISTS will save you time and money in pole setting, rail handling and on many other jobs around your barns, shops, or garages. The 345-lb. single-drum Turbinair Hoist will lift a ton on single line, or pull a 50-ton car. Electric hoists also available in single and two-drum models to 35 H.P. *Send for Catalogs.*

Concrete Breaker (Catalog 3281-V)

Clay Spader (Catalog 3281-N)

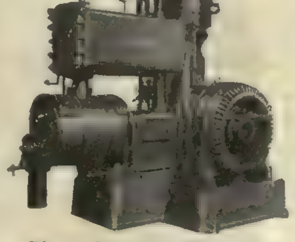
Simplify Brake Testing, Cleaning, Painting, and many other tasks in shop and garage

SULLIVAN BALANCED ANGLE COMPRESSORS are free from vibration—and supply low-cost air to simplify many tasks in the shop and garage. They can be had in capacities from 313 to 5,100 cu.ft. Any Balanced Angle Compressor can be driven by belt, or by direct connection to electric motor, or oil engine. Additional features of these machines are multi-step control, Wafer valves, and positive, automatic lubrication. *Catalog 3283-J.*



WG-6 Compressor

SINGLE STAGE BELT DRIVEN COMPRESSORS, class "WG-6", offer dependable air power for smaller requirements. Capacities are 68 to 500 cu.ft. "WG-6" is splash-oiled, and has "sweep control" unloading, "Wafer" valves, and two-part die-cast removable main bearings. *Catalog 3283-I.*



Direct Connected Balanced Angle Air Compressor

SINGLE STAGE DIRECT CONNECTED COMPRESSORS, Class "WL-22", and Class "WL-44" are especially adapted to small shops, isolated departments, or stand-by or night service. They embody advantages of small floor space, easy portability, direct motor drive, or automatic, hand, and combination control. Capacities 100 to 350 cu.ft. *Catalog 3283-H.*

WLDX-44 Compressor

SULLIVAN

TRADE MARK

SULLIVAN MACHINERY COMPANY, 150 South Michigan Ave., Chicago

Spray guns of various types and sizes.
Pressure feed paint tanks and containers.
Spray booths, exhaust fans, and approved lighting fixtures.
Air compressing equipment.
Air transformers and accessories.
Air and fluid hose and connections.
Complete outfits from the smallest hand-operated units to the largest industrial installations.

WHEN you buy a spray-painting or spray-finishing system you are buying the work that it will do rather than a spray gun, an air transformer, or a paint tank.

The problem of finish maintenance on transport units involves the time element far more than many others. Perfect results, accomplished with the maximum of speed and economy, are the principal considerations. DeVilbiss equipment has revealed to many a new and better method and equipment for the quick, economical, and adequate refinishing of cars and buses, for the DeVilbiss Company has always assumed responsibility for the results accomplished with a DeVilbiss Spray System. This fact has made the DeVilbiss organization the leader in the development as well as in the manufacture and sale of such equipment. This responsibility is worth far more to the user than the mere labor and materials in any spray system.

It will pay you to learn what you can do in your business today with a spray system sold squarely on its proved accomplishment. We will gladly tell you.

DeVilbiss
Spray-PAINTING FINISHING System

THE DEVILBISS COMPANY • 272 PHILLIPS AVENUE • TOLEDO, OHIO
Sales and Service Branches
NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO ST. LOUIS
SAN FRANCISCO WINDSOR, ONT.
Direct factory representatives in all other territories

Leaders Do Not Copy— They Originate

Lang Body Co. has always been a leader—it is that kind of an organization. Always contributing to the development of the bus industry.

Note these two beautiful new bodies. Each is an achievement; they sound again the note of Lang Leadership.

Distinction In Parlor Coaches

Another Lang Parlor Coach Achievement—the Junior Edition 21 passenger, which is a companion to the 30 passenger all metal Parlor Coach.

The characteristics of this body are—sound engineering—light weight with maximum strength—full headroom—liberal baggage accommodation both inside and outside.

The following large fleet operators are using these Lang Bodies:—

Missouri Pacific Transportation Co.
Empress Taxi Sightseeing Co.
Greyhound Lines
Rex Finance Co.
Southwestern Transportation Co.

LANG

Lang *All Metal* 39 Passenger City Type

One of Lang's greatest contributions to city operation—the All Metal Large Capacity Body.

For use with Leading Large Capacity Chassis Units.

Built either with or without rear treadle door exit—for Straight City or Semi-DeLuxe Service.

Recent purchases of fleets of these have been made by:—

The Cleveland Railway Co., Cleveland, Ohio
The Capitol Traction Co., Washington, D. C.
The Community Traction Co., Toledo, Ohio
The Eastern Michigan Railway
The Northern Ohio P. & L. Co., Akron, Ohio

The Lang Body Co., Cleveland, Ohio

BODIES

Electrically controlled and operated Oakite cleaning vat, babbitt pot and preheating furnace in babbitt room of an electric railway car shop.

Cleans used bearings before rebabbitting

IN the shops of a Pacific Coast traction company, axle and armature bearings are cleaned the Oakite way before rebabbitting. Shopmen find that the adoption of Oakite cleaning materials and methods speeds up work all along the line; enables them to pour approximately 2500 lbs. of babbitt per day.

Worn bearings are boiled in a vat containing a solution of an Oakite material. When taken out they are free of all grease and dirt; ready for the removal of the old babbitt. And, because the bearings are absolutely clean, without a trace of film they can be prepared for rebabbitting in a fraction of the usual time.

Oakite cleaning materials and methods effect similar savings in time and effort wherever they are used. Write for booklets describing their use in car, bus, repair and paint shops. No obligation.

Oakite Service Men, cleaning specialists, are located in leading industrial centers of U. S. and Canada.

Manufactured only by

OAKITE PRODUCTS, INC., 28B Thames St., NEW YORK, N. Y.

OAKITE

TRADE MARK REG U.S PAT. OFF.

Industrial Cleaning Materials and Methods

"Consolidated Equipment will advertise your service"

Only with up-to-date rolling stock can the electric railway hope to hold a "White-Light" public. The best advertisement of transportation is a truly modern car—*fast, safe and comfortable.*

CONSOLIDATED ELECTRIC CAR HEATING with THERMOSTAT CONTROL for *comfort*

CONSOLIDATED BELLS AND BUZZERS for *speed* and passenger *convenience.*

CONSOLIDATED PNEUMATIC DOOR OPERATORS and EXIT TREADLE for *speed* and *safety.*

These are essential devices for any modern car.

CONSOLIDATED CAR-HEATING COMPANY, INC.

NEW YORK ALBANY CHICAGO

Oklahoma Transportation Co. Buys 20th Studebaker

Two New 8-Cylinder STUDEBAKERS now cover difficult route

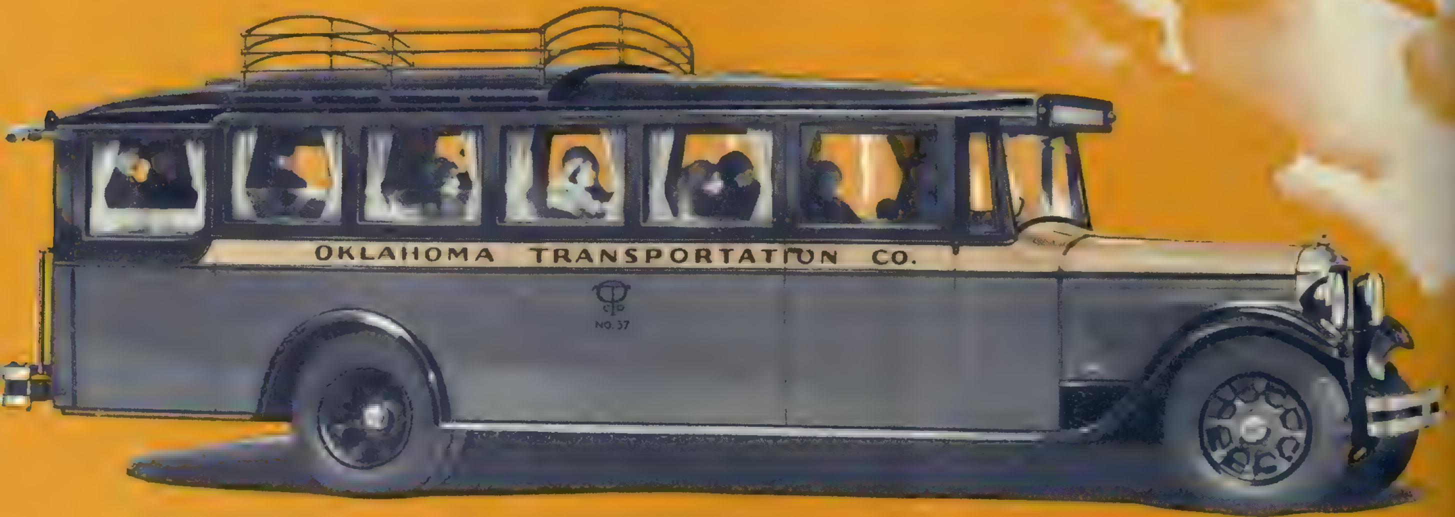
CONFIDENCE based on years of experience with Studebaker busses caused R. G. Hickox, General Manager of the Oklahoma Transportation Company to purchase the first two Studebaker Straight Eight Busses delivered in Oklahoma.

"They are splendid units," said Mr. Hickox, "and come up to our expectations in every way. They were put on our most difficult route because of the excess power of the new 8-cylinder motors. Ease of handling enables our drivers to maintain their schedules regardless of the mud. And when it rains down here we have gumbo.

FIRST BUS STILL SERVES

"Studebaker busses have played a vital part in the development of this company. When we decided to go into the bus business in 1924, we bought a Studebaker. This original bus has now gone more than 300,000 miles and is still covering 200 miles a day.

"Every phase of our operation is comparable to Pullman service. Our four termin-



With the purchase of two new Studebaker Straight Eight busses the Oklahoma Transportation Company now has a fleet of 20 Studebaker units. Evidence of this Company's complete satisfaction is seen in its repeat orders.

STUDEBAKERS are

Americas First Straight Eight Bus

STUDEBAKER meets tomorrow's demands in what it does today. The demand for greater power, higher speeds and smoother operation made the production of straight eight motors for large units inevitable.

Studebaker anticipated this condition and for two years has been perfecting a straight eight motor which provides every essential for better bus operation.

The exhaustive driving tests at the Studebaker Proving Ground proved the stamina, power and economy of this new straight eight bus motor. The result is a proven motor of 115 horsepower which gives smooth effortless speed, economical operation, plus the stamina to carry heavy loads with ease and absolute dependability.

Not only have Studebaker engineers turned a new page in bus transportation history by developing this new straight eight motor, but they have gone still further by strengthening the chassis and providing larger and huskier units throughout. The entire chassis has been designed to give still greater power and stamina - - - qualities for which Studebaker busses are famous the world over.

als are well kept depots; our way stations provide every essential for passenger comfort.

"This company is managed by experienced transportation and railway executives. My own experience dates back to '89 when I drove a four horse stage between El Reno and Oklahoma City. Our general passenger agent, C. O. Jackson, was 30 years with the Frisco Railroad where he served as general freight and passenger agent. R. K. Adams, our general superintendent is from the Santa Fe.

"Fortified with such experience, this company has grown until our routes now cover 411 miles. We have a daily mileage on our 20 Studebakers of 3500 miles, handling an average of 700 passengers.

STUDEBAKERS MOST ECONOMICAL

"We are buying Studebaker busses when new equipment is needed because our records prove them to be most economical to operate and to maintain. Studebakers cost less to buy and stand up well for thousands of miles, therefore the depreciation is low. With reasonable traffic, Studebaker equipment, common sense and proper finance any bus operator can make a success."

Lower
first cost
operating cost
maintenance
depreciation

Prices

Studebaker Straight Eight Bus

Model 77

158-inch Straight Eight Junior Chassis

Chassis only, single or dual rear wheels..............	$2585

Model 88

184-inch Straight Eight Special Chassis

Chassis only, single or dual rear wheels..........................	$2985
22-Pass. Seminole Parlor Car	$6595

Model 99

184-inch Straight 8 Heavy Duty Chassis

Chassis only, single rear wheels....	$3385
Chassis only, dual rear wheels.....	$3485
21-Passenger Street Car Bus.......	$6095

All prices F. O. B. Factory. Purchase can be arranged on Studebaker's liberal budget payment plan.

THE STUDEBAKER CORPORATION OF AMERICA,
Dept. B South Bend, Ind.

Please send complete information on Studebaker Straight Eight Busses, without obligation.

We have________busses at present. Check below the Studebaker Bus about which you desire information. Seminole________Street Car________

Name________________

Address________________

City________________

State________

B-4-29

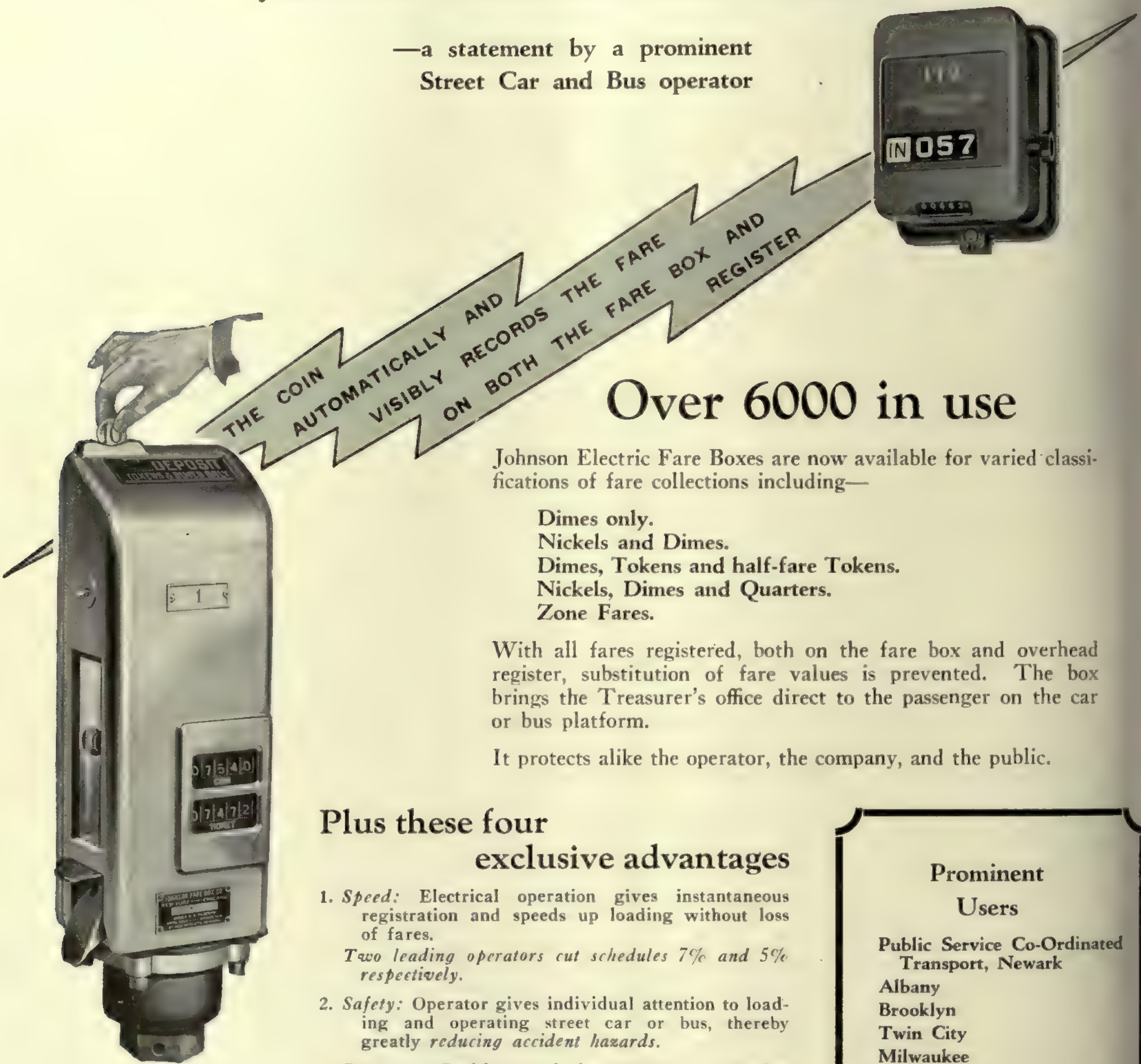
Profit Makers

"Our 100% one man operation

would not have been possible without

JOHNSON ELECTRIC FARE BOXES"

—a statement by a prominent
Street Car and Bus operator


THE COIN AUTOMATICALLY AND VISIBLY RECORDS THE FARE ON BOTH THE FARE BOX AND REGISTER
IN 057
DEPOSIT

Over 6000 in use

Johnson Electric Fare Boxes are now available for varied classifications of fare collections including—

- Dimes only.
- Nickels and Dimes.
- Dimes, Tokens and half-fare Tokens.
- Nickels, Dimes and Quarters.
- Zone Fares.

With all fares registered, both on the fare box and overhead register, substitution of fare values is prevented. The box brings the Treasurer's office direct to the passenger on the car or bus platform.

It protects alike the operator, the company, and the public.

Plus these four exclusive advantages

1. *Speed:* Electrical operation gives instantaneous registration and speeds up loading without loss of fares.
   Two leading operators cut schedules 7% and 5% respectively.
2. *Safety:* Operator gives individual attention to loading and operating street car or bus, thereby greatly *reducing accident hazards.*
3. *Revenue:* Positive and instantaneous operation eliminates human element in accounting. The coin does all the work.
   Revenues increased 3% to 10%.
4. *Checking:* Instantaneous, visible registration of fares and audible signal makes checking positive.
   Loading can be accurately checked from sidewalk.

Prominent Users

Public Service Co-Ordinated Transport, Newark
Albany
Brooklyn
Twin City
Milwaukee
Worcester
Holland Tunnel
County Transportation
Chicago Motor Coach Co.

JOHNSON FARE BOX COMPANY

CHICAGO, ILL.
4619 Ravenswood Ave.

NEW YORK, N. Y.
2 West 61st St.

Over 50,000 Type D Johnson Fare Boxes have been placed in service in the past 16 years.

Already over 6,000 Type J Electric Fare Boxes have been placed in service in the last 4 years

Upper left, Wheeling, W. Va. *Upper right,* Vancouver, B. C. *Lower left,* Zanesville, Ohio. *Lower right,* Cleveland, Ohio.

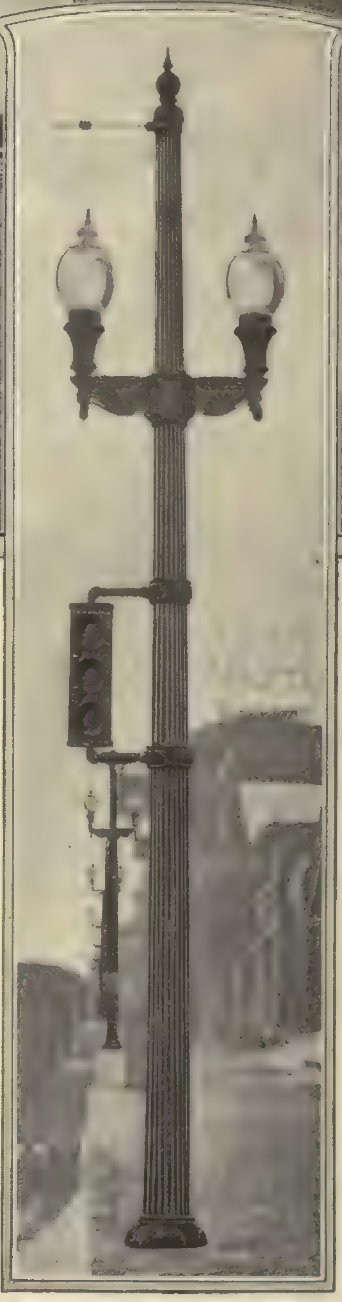
Cities Everywhere Stage Curbline Cleanup

Never before has the City Beautiful plan met with such success as it has during the past few years. Cities everywhere are making their streets safer and more beautiful.

Important in this work is "cleaning up the curbline." Dozens of Utilities, co-operating with municipal officials, have installed Union Metal Fluted Steel Poles and combined all street electrical equipment on this one set of poles.

The net result is economical service and more beautiful streets. This method has been followed in such cities as Detroit, Cleveland, Vancouver, B. C., Wheeling, W. Va., Pontiac, Mich., Youngstown, Ohio, and is contemplated by many more. In every case invaluable good will has accrued to the benefit of the companies responsible for the improvement.

Union Metal Poles are used for transmission and distribution, for telegraph and telephone wires, and for supporting lighting units, trolley span wires and traffic signal lights. They represent the most modern equipment yet developed for this service.



Union Metal Fluted Steel Pole equipped with lighting units, traffic signal and trolley span wire support as used in Pontiac, Mich.

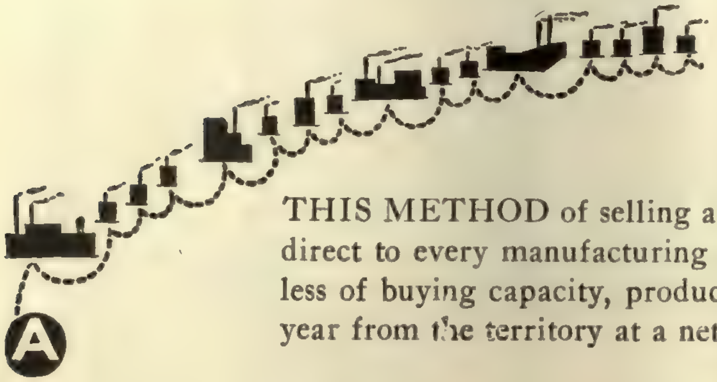
THE UNION METAL MANUFACTURING CO.
General Offices and Factory, Canton, Ohio
Sales Offices—New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta.
Distributors:
G-E Merchandise Distributors Association Graybar Electric Company, Incorporated
Offices in all principal cities

UNION METAL

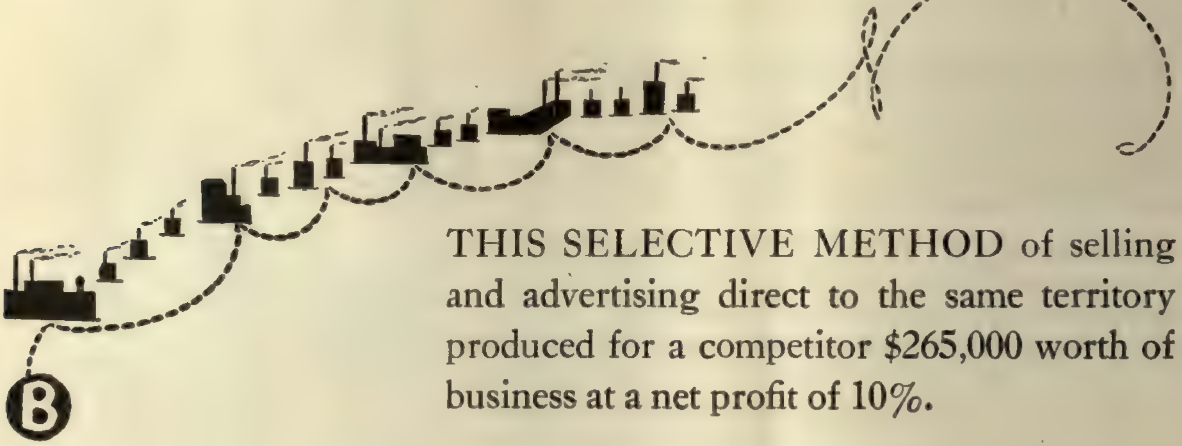
DISTRIBUTION AND TRANSMISSION POLES

This is one of a series of McGraw-Hill advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

VOLUME *vs.* PROFITS



THIS METHOD of selling and advertising direct to every manufacturing plant, regardless of buying capacity, produced $250,000 a year from the territory at a net profit of 2%.



THIS SELECTIVE METHOD of selling and advertising direct to the same territory produced for a competitor $265,000 worth of business at a net profit of 10%.

Practical Industrial Advertising Coverage, like practical sales coverage, is a problem of selecting the plants with buying capacity and directing sales and advertising effort thereon.

You are invited to make at any time a personal inspection of McGraw-Hill circulation methods which produce the Practical Industrial Advertising Coverage illustrated in "B."

—*The publishers*

◆◆ BEHIND THE PYRAMIDS—4 ◆◆

N C C

Calcined for 30 days

View of calcining furnaces

PROBABLY the most unexpected operation in the manufacture of carbon brushes is that of calcining.

Raw lampblack is mixed with tar and formed into rectangular blocks or "pugs."

These large pugs from the pug mill are placed in carefully spaced positions inside a large furnace and the whole packed with coke dust.

It takes 30 *days to complete the calcining operation.*

For 30 days the pugs remain in the furnace. During most of that time they are heated to a temperature of approximately 1000 degrees Centigrade.

This drives out all the volatile matter. The soft, easily broken "green" pugs are transformed into blocks of practically pure carbon, hard as bricks and somewhat porous. And finished brushes over thirty days away!

Over thirty days must pass before this material takes the form of finished brushes. But we maintain continually a stock of semi-finished brush blocks or blanks, from which brushes to your exact specifications can be made with the utmost speed, without waiting for the operations now going on in our factory to be completed. If we have installed the Data Sheet System for you, with its minimum stock of spare brushes, no brush emergencies should be experienced. Ask us to explain the great value of this remarkably thorough system.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown on request to any organization of engineers or students.

NATIONAL CARBON COMPANY, Inc.

Unit of Union Carbide UCC *and Carbon Corporation*

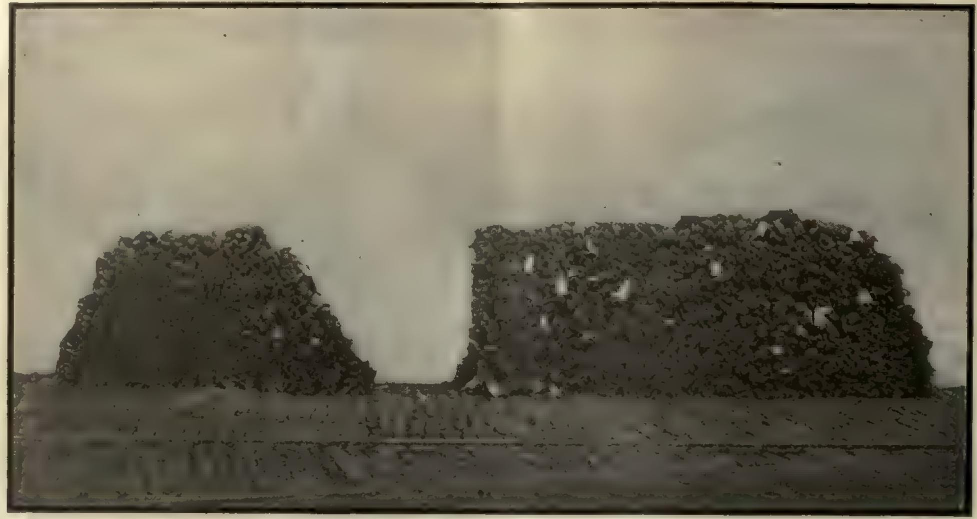
Carbon Sales Division

SILVER STRAND CABLE TRADE MARK REGISTERED

Cleveland, Ohio

Branch Offices and Factories

Jersey City Pittsburgh Chicago Birmingham San Francisco



Four
Sound Reasons

Why Diamond "S" Brake Shoes
Should be Used on all Cars

1. You can make a 25% reduction in the number of brake shoes to be purchased, distributed, applied and removed.
2. You can save 25% in the tonnage of brake shoes to be purchased.
3. You can make a saving of 12% in your annual bill for brake shoes.
4. You can materially reduce the labor needed for application of new brake shoes and in handling scrap brake shoes.

Any one of these four reasons is enough.

The photograph shows two piles of worn out Brake Shoes. The smaller pile shows Diamond "S" scrap. The larger pile, Cast Iron Shoes required to do the same amount of work as the smaller pile.

**THE AMERICAN BRAKE SHOE
AND FOUNDRY COMPANY**

30 CHURCH ST., NEW YORK
332 SO. MICHIGAN AVE., CHICAGO

WHY POLES BREAK

Studies in Pole Line Design

Number one of a series of six. This is the first of six advertisements on pole line design. Each will include a detailed discussion of an important phase of this subject and present data which it is hoped will be of service to engineers and users of poles. It is suggested that the series be preserved for future reference.

AMERICAN CREOSOTING COMPANY
LOUISVILLE, KENTUCKY

conomy prompts he same care in selecting ole types, sizes, spacing, nd other line details s is used in designng any important lectrical equipment.

Turn the page for a rather complete discussion of pole strength and its relation to pole line design.

"Rule of Thumb" methods have no place in the modern successful utility. The design of pole lines is one of the last strongholds of the old system.

Why Poles Break

A pole is a cantilever beam. While it is subject to a variety of stresses failure is almost invariably caused by bending moments. A pole breaks, therefore, when the stress in the outer fibres resulting from the bending moments exceeds the natural resisting strength of the wood.

Where Poles Break

While a mathematical solution shows the critical section in a pole to be at the point where the diameter is one and one-half times the diameter at the point of load application, for practical designing purposes this point coincides with the ground line.

Calculating Load

The maximum load tending to break a pole is that produced by a transverse wind when pole and wires are covered by sleet. The bending moment at the ground line is the sum of two quantities—(1) the moment calculated as the wind pressure times the projected area of the pole, times the distance of the center of gravity of the exposed section of the pole above the ground and—(2) the wind pressure times the projected area of the wires (with sleet, if any) in the adjacent span times the distance of the wires above the ground.

The Resistance to Breaking

The moment of resistance of a pole opposes the bending moments calculated as shown above. This moment of resistance is calculated as the ultimate fibre stress in pounds per square inch, times the cube of the ground line diameter in inches divided by 122. Whether a pole breaks, therefore, depends on whether the moment of resistance is greater or less than the moment of bending.

The bending moment is multiplied by the factor of safety required on the line. From the resulting moment of resistance is computed the ground line diameter by reversing the process referred to above, using in this calculation the fibre stress of the species wood selected. Ordinarily the strongest wood is the most economical.

Ultimate Fibre Stress Critical Factor

It is obvious, therefore, that one of the critical factors in designing an economical pole line is the selection of the pole with the highest ultimate stress. The remainder of the design, of course, requires good judgment and careful calculations but it is all subject to ordinary engineering design procedure.

How Do We Know the Ultimate Fibre Stress?

The ultimate fibre stress of a given pole can only be determined by elaborate testing methods far beyond the possibilities of the ordinary buyer. Since wood is a product of Nature and not subject to scientific control, its physical properties are not absolutely uniform. The test of a single pole would not be conclusive, therefore. The only practicable way to determine ultimate fibre stress in species of wood available for poles is to rely on records of extensive tests undertaken by government and other disinterested agencies.

Southern Pine Association tests show a modulus of rupture of that wood of 7500 to 8800 lbs. per square inch green and 13,900 to 18,300 lbs. per square inch air dry. The same wood is shown by Forest Products Laboratory tests to have a modulus of rupture 7600 to 8700 lbs. per square inch green, and 13,000 to 15,500 lbs. per square inch air dry. These figures are all based on averages of many tests. There is no other wood commercially available for pole use with a strength approaching these figures. For purposes of comparison, the fact may be mentioned that the Forest Products Laboratory figures for western red cedar are 5200 lbs. per square inch green, and 7700 lbs. per square inch air dry.

Conservative designers take these and similar figures to indicate that if 7200 lbs. per square inch is used for southern yellow pine, the comparable figure for cedar should not exceed 5000 lbs. and if 6800 lbs. per square inch is taken for pine as is frequently done, the comparable figure for cedar should not be more than 4300 lbs.

Moment of Resistance Tabulated

For convenience in comparing designs, the following tables showing moment of resistance to bending have been computed for both pine and cedar on the basis of the modulus of rupture indicated above.

WESTERN RED CEDAR POLES CONFORMING TO N. E. L. A. AND A. T. & T. SPECIFICATIONS

Based on Modulus of Rupture of 4300 Pounds per Square Inch

	Class A		Class B		Class C		Class D	
Length of pole (feet)	Cir. 6 ft. From Butt	Moment of Resistance	Cir. 6 ft. From Butt	Moment of Resistance	Cir. 6 ft. From Butt	Moment of Resistance	Cir. 6 ft. From Butt	Moment of Resistance
20	30	30,563	28	24,849	26	19,895	24	15,648
25	34	44,491	31	33,723	28	24,849	26	19,895
30	37	57,338	34	44,491	30	30,563	28	24,849
35	40	72,447	36	52,814	32	37,092	30	30,563
40	43	90,001	38	62,114	34	44,491	32	37,092
45	45	103,152	40	72,447	36	52,814	....	....
50	47	117,526	42	83,866	38	62,114	....	....
55	49	133,177	44	96,427	....	....	....	....
60	52	159,166	46	110,183	....	....	....	....
65	54	178,247	48	125,188	....	....	....	....
70	55	188,334	50	141,498	....	....	....	....
75	56	198,795	52	159,166	....	....	....	....
80	57	209,636	54	178,247	....	....	....	....
85	59	232,486	56	198,795	....	....	....	....
90	61	256,940	58	220,864	....	....	....	....

CREOSOTED YELLOW PINE POLES—AMCRECO SPECIFICATIONS OR A. T. & T. 6050

Using a Modulus of Rupture of 6,800 Pounds per Square Inch

Length	SIZE CLASSIFICATION OF SPECIFICATION No.25						
of Pole (Feet)	Class AAA	Class AA	Class A	Class B	Class C	Class D	Class E
16	....	....	....	....	....	15,457	11,360
18	....	....	....	....	23,285	17,831	13,304
20	....	....	39,387	33,390	26,386	20,437	15,457
22	....	....	43,760	35,316	29,750	23,285	17,831
25	67,455	53,452	48,444	39,387	33,390	26,386	20,437
30	76,927	67,455	58,793	48,444	39,387	33,390	26,386
35	90,883	76,927	67,455	58,793	48,444	39,387	33,390
40	102,391	90,883	76,927	67,455	58,793	48,444	39,387
45	114,831	102,391	90,883	76,927	67,455	58,793	....
50	128,240	114,831	102,391	90,883	76,927	67,455	....
55	142,654	128,240	114,831	102,391	90,883	....	....
60	163,500	142,654	128,240	114,831	102,391	....	....
65	180,401	163,500	142,654	128,240	....	....	....
70	198,428	180,401	163,500	142,654	....	....	....
75	217,618	198,428	180,401	163,500	....	....	....
80	238,007	217,618	198,428	....	....	....	....
85	259,631	238,007	217,618	....	....	....	....
90	282,528	259,631	238,007	....	....	....	....

For additional copies of this series of studies of pole line design or for quotations and information on AMCRECO Creosoted Southern Yellow Pine Poles, address the nearest sales office.

AMERICAN CREOSOTING COMPANY

INCORPORATED

COLONIAL CREOSOTING COMPANY
INCORPORATED

AMCRECO
LOWRY PROCESS CREOSOTED WOOD

GEORGIA CREOSOTING COMPANY
INCORPORATED

LOUISVILLE ~ KENTUCKY

SALES OFFICES

332 S. Michigan Ave., Chicago
350 Madison Ave., New York City
401 W. Main St., Louisville, Ky.
Brunswick, Ga. Bogalusa, La.

Lock it up,

go away,

and forget it.

The American Brown Boveri Mercury Arc Power Rectifier is truly automatic. It takes care of itself by performing the following tasks:

It closes the circuit breaker on the a.c. lines at a predetermined time.

It ignites its own arc.

It connects itself to the direct current busbars.

It starts the pump for the cooling water.

It stops the pump if the temperature becomes too cool.

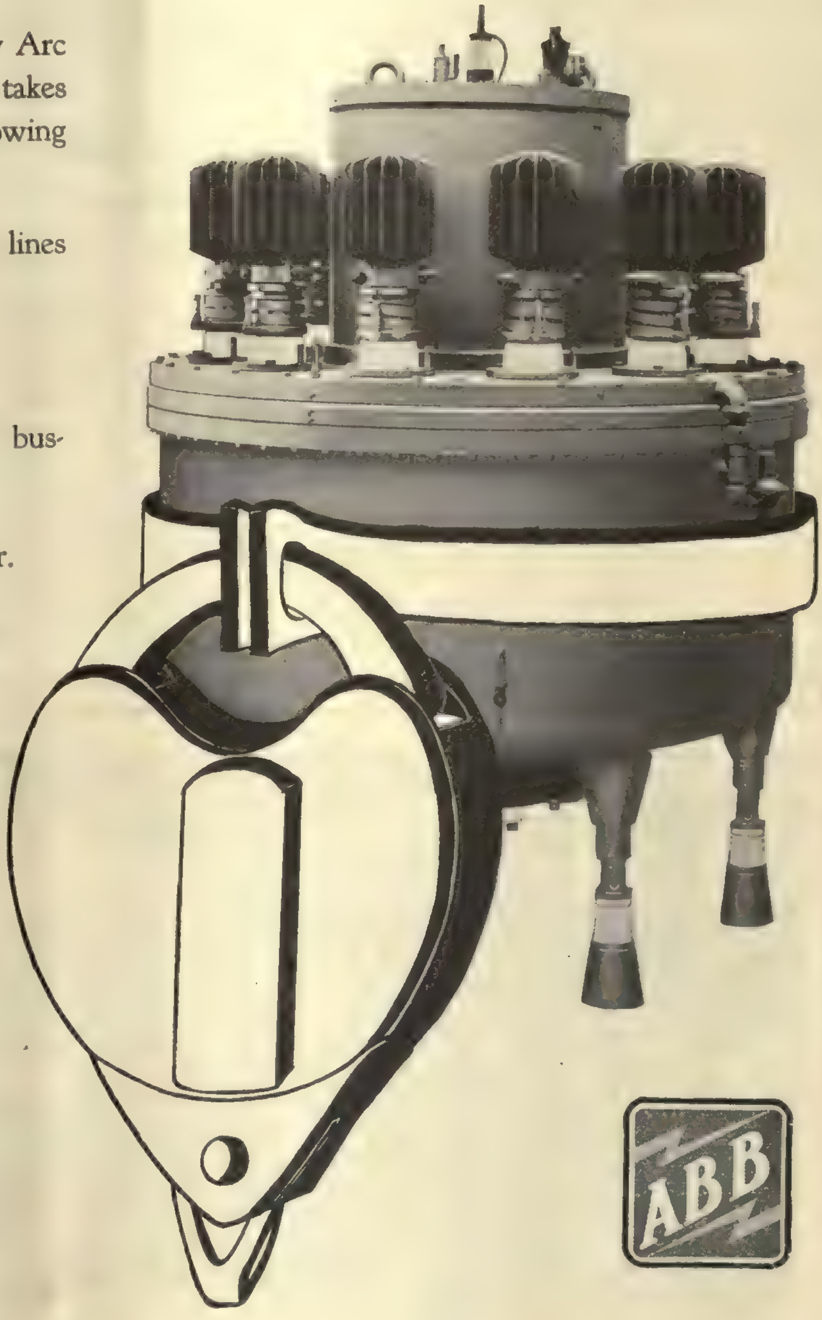
It stops the plant if the cooling water supply fails.

It re-starts it when the water supply is re-established.

If the rectifier gets too hot for any reason, it shuts it down.

It shuts down at stated times as regularly as the whistle blows.

Quite literally, you can lock it up, go away, and forget it.



ABB

American Brown Boveri Electric Corporation
Camden, N. J.

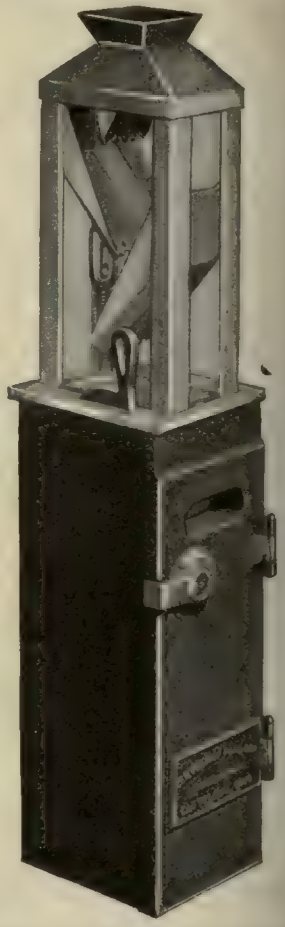
Representatives in all the principal cities.

AMERICAN BROWN BOVERI

The "CLEVELAND" meets all Modern Fare Collection Conditions

1. Evidenced by the number of cities, large and small, that have solved their fare collection problems with aid of "Cleveland" boxes.
2. The "Cleveland" accommodates any rate of cash fare and any kind of ticket.
3. "Cleveland" is individual in its method of efficiently handling and safeguarding fares.
4. "Cleveland" is Safe, Sure, Simple, Strong.

The Cleveland Fare Box Co.
Cleveland, Ohio
Canadian Cleveland Fare Box Co., Ltd., Preston, Ont.



GOOD PRACTICE

CONTINUOUS JOINT BARS FOR WELDING

THE RAIL JOINT CO.
165 Broadway, New York, N. Y.

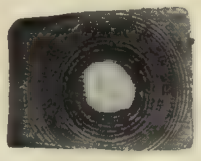
One tiny vulnerable spot — Death found it!

THETIS, goddess mother of mortal Achilles, Hellenic hero of Trojan war, plunged him into he River Styx to make his body invulnerable. But he held him by one heel, which the waters did not over with their protective charm. Before the bloody alls of besieged Troy, Achilles wrought havoc and estruction among the Trojans, himself escaping ounds, defying harm. And then, as he stood in the mple of Apollo, negotiating with Priam for the hand his daughter, Polyxena, the poisoned arrow of eacherous Paris found his ulnerable heel, dealing death. he magic of the Styx was od protection as far as it ent. But its application had cked thoroughness.

It is fact, not legend, that structive termites (white ts), woodpeckers, decay-oducing fungi or marine borers are swift to find the vulnerable spots in partially-improperly or under-treated transmission poles, cross ties, bridge timbers or piling. Spotty or uneven penetration of the preservative does not afford complete protection. And treated wood is no safer than its least protected spot.

Thoroughness distinctively characterizes Prettyman timber preservation. The most complete and modern pressure treating plant in the industry, coupled with finished engineering skill and care, assure deep and uniform penetration full length to the heartwood with creosote oil conforming to standard A.R.E.A. specifications. It completely encases the heartwood in highly toxic sheathing, thick as the sapwood itself. It leaves no vulnerable spots. Yet, Prettyman Preserved Forest Products cost no more. Write for prices.

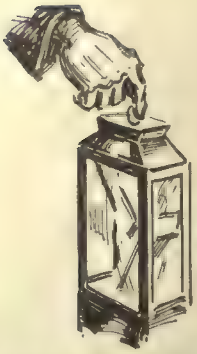
No vulnerable spots here!



PRETTYMAN PRESERVED
P29
FOREST PRODUCTS

Note thorough penetration of creosote oil

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

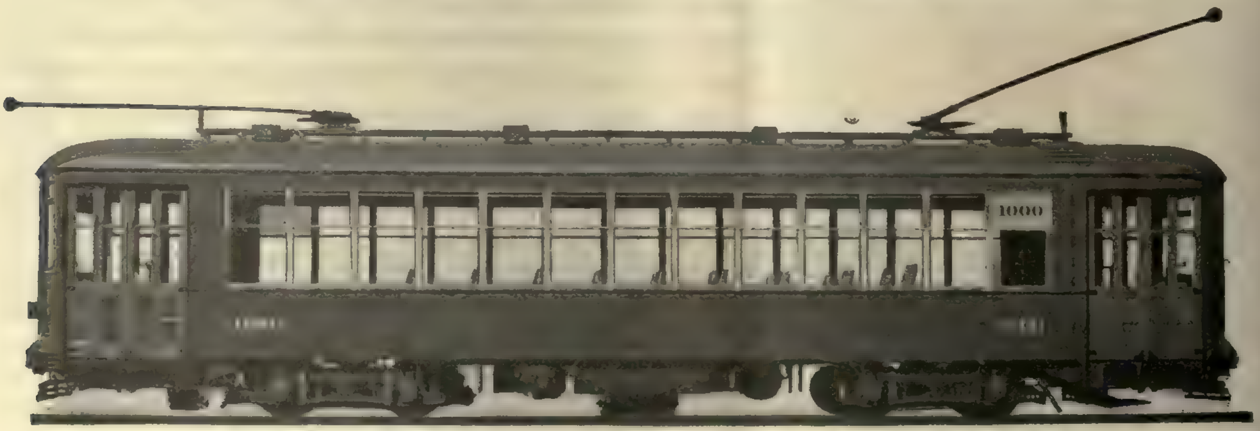


Making Profits in transportation *is a "Selling Job"*

INCREASING patronage to make greater profits is a selling job in which the transportation service as a whole is offered to the public. One most important item of this service is the car itself. That is why electric railway companies are giving so much thought to better cars.

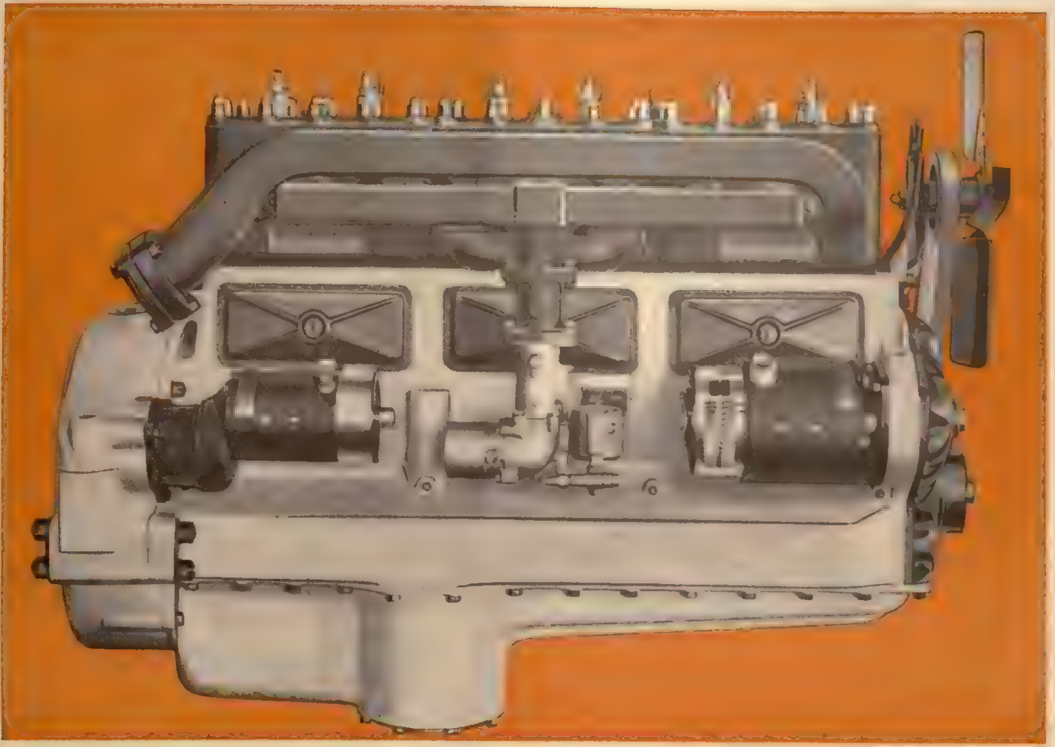
And that is also why so many communities are being served by "Thomas-Built" Cars. Their attractive appearance, extreme safety and unusual comfort attract the riding public, while their lower operating cost appeals strongly to the operator.

Throughout the country "Thomas-Built" Cars are proving their ability to sell more rides at lower cost. Our proposition on your next car order will prove attractive.



PERLEY A. THOMAS CAR WORKS

High Point, N. C.



here's an engine with *Remarkable Stamina*

The engine of the old "benzine buggy" fairly bristled, it had so many different parts. Since trouble was always developing with one or another of them, it was decidedly a case of compulsory accessibility.

Today it's different. The Waukesha Engine is famous for its Non-Stop features. The working parts Keep On Working. Take a look at this Heavy-Duty Waukesha Engine with its genuine Ricardo Head. See how perfectly protected the working parts are. Not only that but Waukesha has positive filtered oil lubrication, triple strength crankshaft, "girder" type crankcase, "truncated non-rocking cylinders." All these features combine to give Waukesha its remarkable stamina in heavy-duty service. Write Automotive Equipment Division for descriptive Bulletin No. 710.

WAUKESHA MOTOR COMPANY

WAUKESHA, WISCONSIN

New York Office: 8 West 40th St.

San Francisco: 7 Front Street

Exclusive Builders of Heavy-Duty Internal Combustion Engines for Over Twenty Years

What a "PROVING GROUND" for tires!

In long distance passenger service, Southern Pacific Motor Transport Company of San Francisco uses Goodyear Balloon Bus Tires

Round trip 2030 miles. Los Angeles to El Paso and return. 160 feet below sea level to more than a mile high. Blistering desert trails—remote mountain roads—fast schedules on fine paved highways—beside palms and cacti—from the modern civilization of great cities, past the crumbling reminders of a civilization lost in antiquity—this is one of the several routes run by the motor coaches of the Southern Pacific Motor Transport Company.

Undaunted, this fleet travels the Apache Trail on Goodyear 40 x 9.75 Balloon Tires. The sharp-cleated All-Weather Tread must hold the coaches safely on their way, on every road in every weather. The extra resilience, the extra vitality of SUPERTWIST in the tire body must play its important part in heat resistance, and in cushioning passengers over stretches far from smooth.

Under such conditions, the Southern Pacific Motor Transport Company reports that Goodyears are delivering *long and trouble-free mileage.* What more could anyone ask of tires?

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service, and there are also Goodyear Rubber Tire Chains

GOODYEAR

Copyright 1929, by The Goodyear Tire & Rubber Co., Inc.

"Long retains its original lustre"

The outstanding characteristic of genuine Massachusetts Mohair Plush is its power to retain its original lustre. After years of continual service under the most trying conditions, the lustre remains.

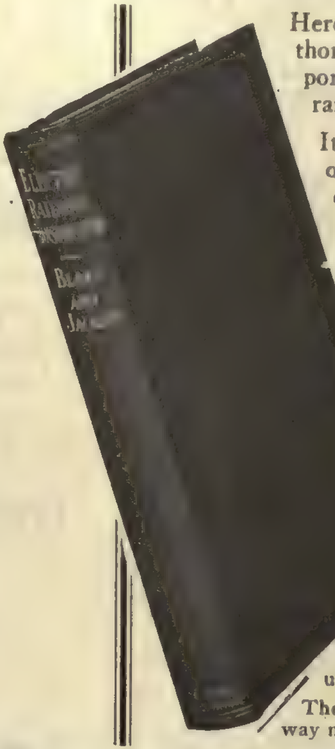
When soiled, the natural brightness of the material is readily restored by cleansing methods that are available in any car shop.

The reason for this is simple. The lustre is in the fibre, and is not produced by any artificial method.

MASSACHUSETTS MOHAIR PLUSH CO.
Makers of BAY STATE PLUSH
Main Office:
80 Federal St., BOSTON, MASS.

Railway Representatives
Midgley & Borrowdale
1822 McCormick Building, Chicago, Ill.

A complete guide to modern transportation practice—



Here is a book that offers you a thorough coverage of every important phase of modern electric railway transportation.

It gives the most valuable kind of information on getting the car over the line—meeting outside bus competition—handling traffic difficulties—making and maintaining schedules—collecting fares—securing the proper public relations — using the supplementary service— trackless trolleys—keeping the working force efficient and hundreds of other important electric railway points.

How successful companies accelerate traffic movement—

How electric railways are using the motor bus—

The selection and training of railway men—

Electric Railway Transportation

By HENRY W. BLAKE, Senior Editor, *Electric Railway Journal* and WALTER JACKSON, formerly Associate Editor, *Electric Railway Journal.*

437 pages, 6x9, 121 illustrations, $5.00 postpaid

The motor bus in the modern transportation scheme is discussed thoroughly. The book shows how the bus is being utilized in supplementing railway service and points out how bus competition is being successfully met by transportation companies. The book also gives valuable information on the emphasis placed upon merchandising in securing for a road the maximum traffic.

See it for 10 days FREE

Use this coupon

Chapter Headings

I. Organization and Definitions.
II. Adjustment of Traffic to Service.
III. Accelerating Traffic Movement Along the Line.
IV. Accelerating Traffic Movement on the car.
V. Car Types in Relation to Traffic.
VI. City Timetables—Preliminaries.
VII. Interurban Schedules and Dispatching.
VIII. Fares
IX. Fare Collection Practices and Devices.
X. Public Relations.
XI. Promotion of Passenger Traffic.
XII. Traffic Signs for Cars, Station and Road.
XIII. Motor-Bus Operation by Electric Railways.
XIV. Selection and Training of Men.
XV. Wages and Wage Agreements.
XVI. Employee Relations.
XVII. Discipline of Trainmen.
XVIII. Forms of Extra Pay.

McGRAW-HILL FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

You may send me on 10 days' approval, Blake and Jackson's—ELECTRIC RAILWAY TRANSPORTATION, $5.00 net, postpaid. I agree to remit for the book or to return it postpaid within 10 days of receipt. (To secure book on approval write plainly and fill in all lines.)

Name ....

Home Address ....

City and State ....

Name of Company ....

Occupation ....

(Books sent on approval to retail purchasers in U. S. and Canada only.)

E. 4-29

Boyerized Parts *mean* Minimized . . . Replacements!

Boyerized parts cut down replacements anywhere from fifty to seventy-five per cent, because they last *three* or *four* times as long as those made of untreated steel. The special process they receive gives them a glass hard wear-resisting shell not found in ordinary parts. And what is more, their cost is only slightly higher, but in no way commensurate with the added service that they render.

Glance over the adjacent list and renew your stock with what items you may need. A check on their performance will soon show you the way toward saving money on fewer parts and on less labor for replacements.

Brake Pins
Brake Hangers
Brake Levers
Pedestal Gibs
Brake Fulcrums
Center Bearings
Side Bearings
Spring Post Bushings
Brake Bushings
Bronze Bearings
Bolster and Transom Chafing Plates
Spring Posts
McArthur Turnbuckles
Manganese Brake Heads
Manganese Truck Parts

BEMIS CAR TRUCK COMPANY

ELECTRIC RAILWAY SUPPLIES
SPRINGFIELD, MASS.

Representatives:

F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Ore.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 519 Delta Building, Los Angeles, Cal.

Break the neck of the bottle

—with

PEREY TURNSTILES

At crowded loading points it is the fare collection that holds down schedules, causes inconvenience to passengers and is responsible for so many losses in revenue.

Perey Fare Collecting and Passenger Control Equipment is the solution to all these problems. No need to junk present equipment. Perey Turnstiles can be used in conjunction with it.

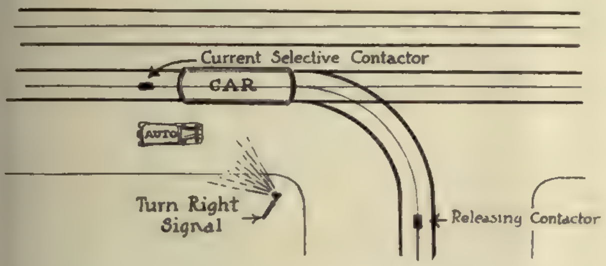
The Perey method of fare collection is not an additional operating expense. It is itself a revenue producer, because it enables you to handle more passengers in a given time, and it more than pays for itself by eliminating extra inspectors, passengers that do not pay, pilfering and extra cars to speed up traffic.

Write for interesting literature.

The PEREY MFG. CO., Inc.
101 Park Ave., New York City

PEREY TURNSTILES
THE COINPASSOR—THE PASSIMETER

Nachod Turn-Right Signal



An effective signal against autoists to prevent them from passing a car on the right when that car is about to make a right turn. The motorman of a car of the main street line will *drift* under current selective contactor and will go straight ahead without causing any signal display. The motorman of car for the diverging route will *use power* under this contactor, to cause the display of a brilliant 3-light Red Signal, lettered on the lenses

STOP—
—CAR
TURNS—

From this the autoist to the side of the car knows that the car will not continue straight, but will make the right turn, and he will wait behind the car. As the car makes the turn, the releasing contactor around the curve restores the signal to the normal dark again.

The Indication Is Arrestive, Explanatory and Is Automatically Displayed Only When Needed.

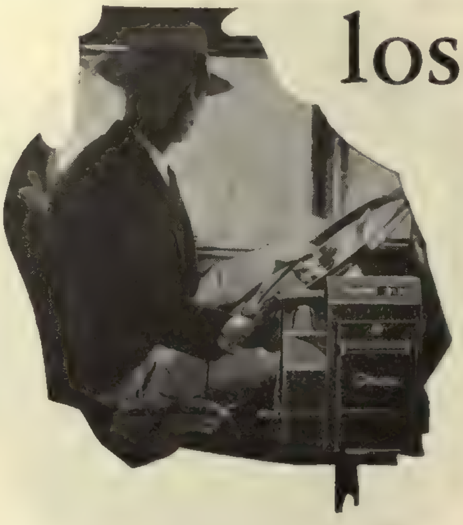
The Turn-right Signal may be operated in connection with a Cheatham Switch, so that the current selective contactor is the same as that for the switch. The signal may also be arranged to operate by *all* cars, if for instance, the main line should end in a loop to the right.

NACHOD SPELLS SAFETY

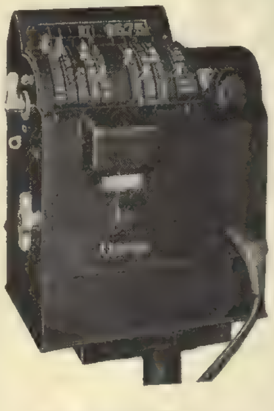
The NACHOD Turn-right Signal will prevent sideswiping collisions. State your conditions with sketch so that we may submit quotations.

**NACHOD & UNITED STATES
SIGNAL CO., Inc.**
Louisville, Ky.
Manufacturers Block and Crossing Signals.

Two transportation companies *stop* $17,700 a year loss-



JUST as the Birch Transportation Co., Inc., of New Brunswick, N. J., is saving $200 a week . . . just as the Newburgh Public Service Corporation increased receipts approximately $7,300 a year . . . you also can profit by the use of OHMER registers.



The OHMER Type 80 Register

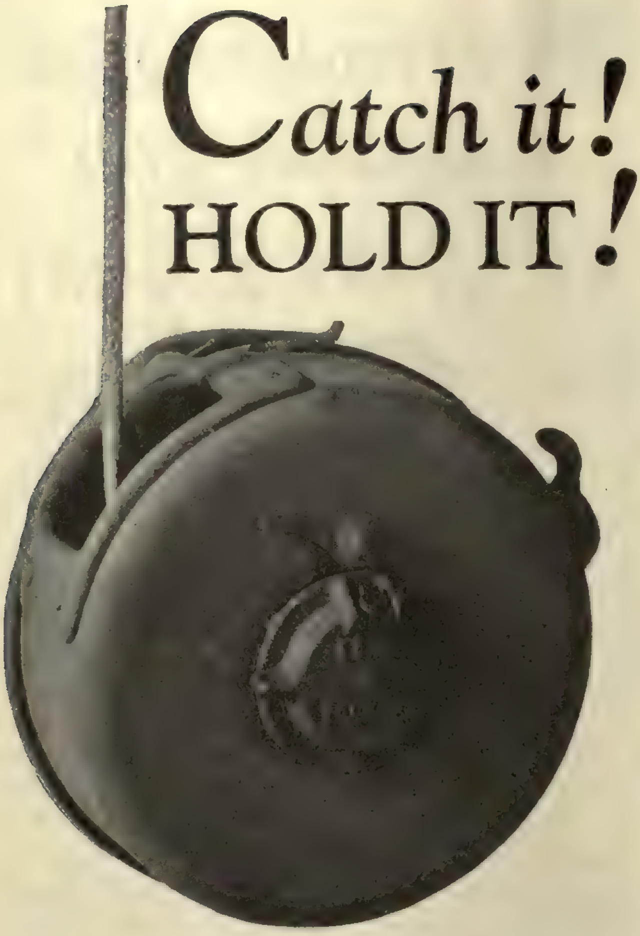
This is the type register which is earning the Birch Transportation Co., Inc., $200 a week. It publicly indicates the amount registered. It totalizes all money received. It prints a ticket and keeps a detailed record of each fare.

Write today for the *facts* about the equipment which makes possible these savings . . . facts which will show you how to realize them in *your* business. Let us explain to you how OHMER registers will safeguard collections, print tickets and simplify bookkeeping . . . how they will more than pay for themselves by stopping cash-fare losses and by eliminating clerical detail.

Write at once for more detailed information. Let us help you determine the type adaptable to your business. This will not obligate you in any way.

OHMER
REG. U.S. PAT. OFF. AND OTHER COUNTRIES
FARE REGISTER COMPANY
Dayton, Ohio, U. S. A.

Catch it!
HOLD IT!



EARLL

Catchers and Retrievers

Catch and hold the Trolley Pole instantly before it can spring above the danger line.

1. No wear check Pawl
2. Free winding Tension Spring
3. Ratchet Wind
4. Emergency Release
5. Perfect automatic lubrication

C. I. EARLL, York, Pa.

Canadian Agents:
Railway & Power Engineering Corp., Ltd., Toronto, Ont.
In All Other Foreign Countries:
International General Electric Co., Schenectady, N. Y.

Heated Clean Air

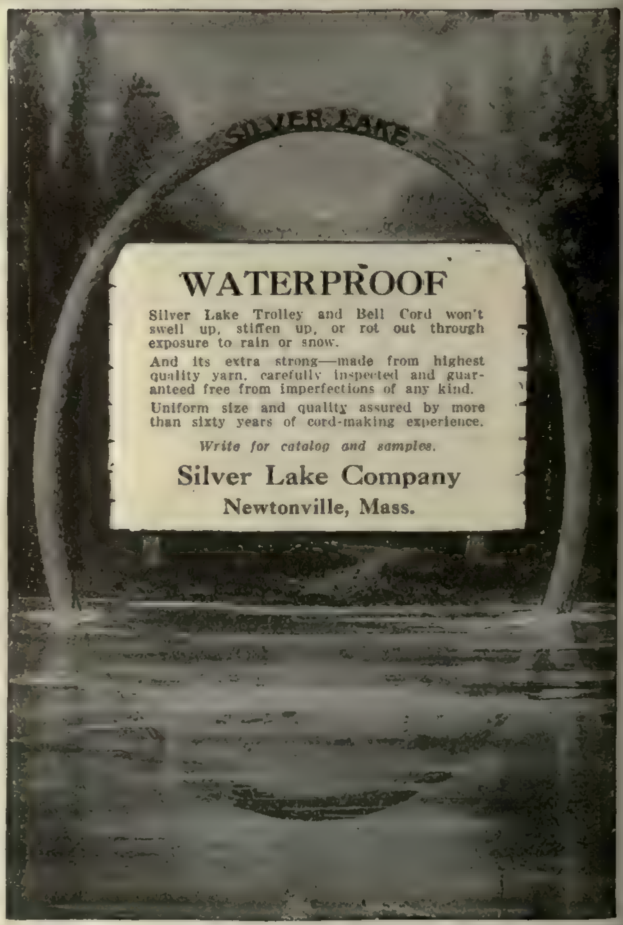
No Gases No Fumes

Is obtained with N-L Motor Coach Heaters. Because of their location in the coach, the heat is evenly distributed throughout by the high speed ball bearing Fans.

N-L Heaters do not have a harmful effect on the motor, using only heat otherwise wasted.

Adoption of N-L Heaters as standard equipment by prominent manufacturers speaks well for their efficiency. Write for detailed information.

The Nichols-Lintern Co.
7960 Lorain Ave., Cleveland, O.



WATERPROOF

Silver Lake Trolley and Bell Cord won't swell up, stiffen up, or rot out through exposure to rain or snow.

And its extra strong—made from highest quality yarn, carefully inspected and guaranteed free from imperfections of any kind.

Uniform size and quality assured by more than sixty years of cord-making experience.

Write for catalog and samples.

Silver Lake Company
Newtonville, Mass.

Bates-Truss Poles for Trolley Suspension

MODERN transportation demands modern methods. The Bates-Truss Pole is the solution of trolley suspension problems. The general tendency of electric railways toward the increased use of Bates-Truss Poles is significant in these days of high costs and keen transportation competition.

Structural simplicity, combined with lasting strength and fine appearance, makes the Bates-Truss Pole ideal for all forms of overhead construction. Let us quote you on poles, structures or towers.

Bates Expanded Steel Truss Co.
EAST CHICAGO, IND.

TRUCK WITH TOWER IN RUNNING POSITION

TRENTON TOWER
This 3-Section

is not only more convenient, but stronger than the older type.

The top section is reinforced by the intermediate section. The 3-section design makes it possible to raise the platform 16 inches higher and drop it 12 inches lower than can be done with the old-style 2-section tower.

We'll gladly send you details.

J. R. McCARDELL CO.
Trenton, New Jersey, U. S. A.

Roebling
Welding Wire

Makes strong welds and is used where only the highest quality of welding wire is acceptable.

John A. Roebling's Sons Company
Trenton, New Jersey

speed-accuracy fewer losses!

result from equipping your men with the

YARDER
Conductor's Case

—sold through your office or by Agent you recommend.

Every conductor needs this sturdy enameled Conductor's case of heavy sheet steel with special tray and compartments for change and transfers. Fitted with strong steel brass-plated lock and two keys. Sizes for city, interurban and bus line conductors. Keeps records clean, prevents losses, saves time, looks neater.

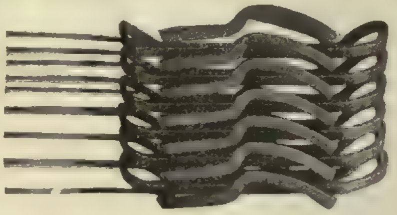
Send for Sample Box

We ship sample box on approval, charges prepaid to any executive sending request on company stationery. If it isn't the best box at its price, send it back collect. Special prices quoted on quantity orders.

Chicago Agent sells 200 to 300 monthly. Superintendent in Southern city ordered 110 after inspecting sample. We manufacture mechanics' tool boxes of every type. Write for circular.

YARDER MANUFACTURING CO.
2817 LAGRANGE ST., TOLEDO, OHIO

IDEAL



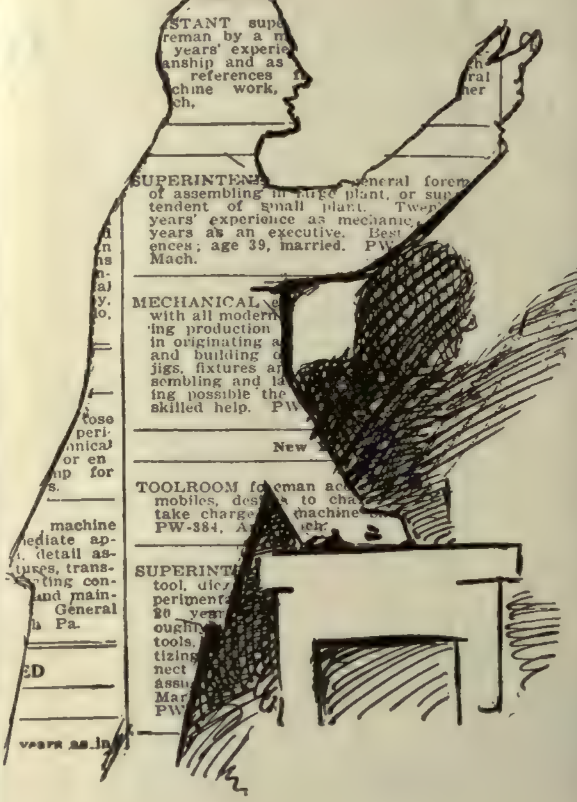
For Replacement

Elliott-Thompson Coils are ideal for replacement because they perform better and last longer.

They slip into grooves without abuse because they're made to fit. That gives the added life.

Order some E.-T. Coils for trial and test them on your next job.

Elliott-Thompson Electric Co.
Ajax Bldg., Cleveland, Ohio



"SEARCHLIGHT"
Want ads Talk—

They go direct to those in the industry you wish to reach and tell your story in a forceful and business-like way.

They don't mince words but get right to the point.

Use them for—

Agencies Wanted
Agents Wanted
Auction Notices
Bids Wanted
Books and Periodicals
Buildings For Sale
Business Opportunities
Civil Service Opportunities
Contracts to be Let
Contracts Wanted
Desk Room For Rent
Desk Room Wanted
Educational
Employment Agencies
Foreign Business
For Exchange
For Rent
Franchises
Help Wanted
Industrial Sites
Labor Bureaus
Machine Shops
New Industries Wanted
Partners Wanted
Patent Attorneys
Patents For Sale
Plants For Sale
Positions Vacant
Positions Wanted
Proposals
Property For Sale
Receivers' Sales
Representatives Wanted
Salesmen Wanted
Specialties
Sub-Contracts Wanted
Water Front Property
Work Wanted

Miscellaneous for Sale, for Rent or Want Ads

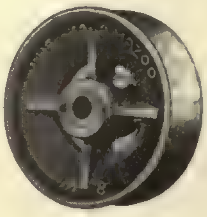
For Every Business Want
"Think SEARCHLIGHT *First"*

0144

A TROLLEY WHEEL

—seems to be a simple thing

BUT it isn't. It has to race along the wire, rain or shine, sparking when ice collects, pounding against trolley ears, and keep running smoothly all the time.



KALAMAZOO

trolley wheels and harps are built by experts — experts who devote their time and energies to no other task. Kalamazoo trolley wheels are the result of over a quarter of a century of study. Is it little wonder that they have received the respect of the industry—that they are standard equipment wherever the best is recognized?

May we send you bulletins and complete information?

The Star Brass Works
KALAMAZOO, MICHIGAN

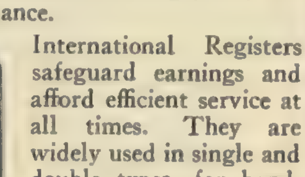
STUCKI SIDE BEARINGS

SPECIAL CARBON STEEL
HEAT TREATED

LARGE WEAR SURFACES
FREE ROLLER
ONLY TWO PARTS

A. STUCKI CO.
OLIVER BLDG., PITTSBURGH, PA.

In harmony with modern car interiors



B-11 Double Register

Beauty and simplicity are first considerations in designing modern car interiors. International Electric Fare Registers fit admirably into such interiors, because of their trim appearance and because they eliminate exposed mechanical equipment. All wiring between register and floor switch is readily concealed without sacrificing accessibility.

Electrical operation also eliminates wearing parts, oiling, noisy rods, and maintenance.

B-12 Electric Back

International Registers safeguard earnings and afford efficient service at all times. They are widely used in single and double types, for hand, foot, and electric operation.

Let us send you full details. Write today.

THE INTERNATIONAL REGISTER CO.
15 South Throop St. Chicago

ENGINEERS *and* CONSULTANTS

Ford, Bacon & Davis
Incorporated

Engineers

39 Broadway, New York
PHILADELPHIA CHICAGO
SAN FRANCISCO
NEW ORLEANS

STEVENS & WOOD
Incorporated

Engineers and Constructors

20 Pine Street,
New York
Transportation Examinations and Reports

THE BEELER ORGANIZATION

Transportation, Traffic,
Operating Surveys,
Better Service
Financial Reports
Appraisals—Management

52 Vanderbilt Ave. New York

ALBERT S. RICHEY
ELECTRIC RAILWAY ENGINEER
WORCESTER, MASSACHUSETTS

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REPORTS-APPRAISALS-RATES
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Construction, Financial Reports.
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CONSULTING ENGINEER
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Transit-Traffic Development Surveys. Street Plans, Controls, Speed Signals. Economic Operation, Schedule Analyses, Bus Co-ordination, Rerouting. Budgets, Valuation, Rate Cases and Ordinances.

EXPERIENCE IN 25 CITIES

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INCORPORATED

Design and Construction
Examinations Reports Appraisals
Industrial and
Public Service Properties

NEW YORK BOSTON CHICAGO

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Gardner F. Wells
Albert W. Hemphill

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INVESTIGATIONS COVERING
Reorganization Management
Operation Construction

50 East 42nd St., New York City

BYLLESBY ENGINEERING *and* MANAGEMENT CORPORATION

BYLLESBY
PIONEERS IN PUBLIC SERVICE

231 S. La Salle Street, Chicago
New York Pittsburgh San Francisco

SANDERSON & PORTER
ENGINEERS

PUBLIC UTILITIES
AND
INDUSTRIALS

DESIGN AND CONSTRUCTION
EXAMINATIONS REPORTS VALUATIONS

NEW YORK
CHICAGO SAN FRANCISCO

E. H. FAILE & CO.

Designers of

Garages— Service
Buildings— Terminals

441 Lexington Ave. New York

WALTER JACKSON

Consultant on Fares
and Motor Buses

The Weekly and Sunday Pass
Differential Fares—Ride Selling

Holbrook Hall 5-W-3
472 Gramatan Ave., Mt. Vernon, N. Y.

The P. Edward Wish Service

50 Church St., NEW YORK

Street Railway Inspection
DETECTIVES

131 State St., BOSTON

May Issue Closes APRIL 15th

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

Electric Railway Journal.

KELKER,
DE LEUW &
COMPANY

Consulting Engineers

Transit Development
Operating Problems
Traffic Surveys
Valuations

111 W. WASHINGTON ST., CHICAGO

Wheels
with
Chilled Rims
and
Chilled Flanges

Griffin Wheel Company
410 North Michigan Ave.
Chicago, Ill.

FOUNDRIES:

Chicago (2)
Detroit
Denver
Cleveland
Boston
Kansas City
Council Bluffs
Salt Lake City
St. Paul
Los Angeles
Tacoma
Cincinnati

PANTASOTE
TRADE MARK

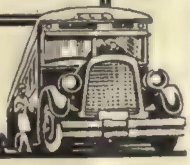
—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE
TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

Standard
for electric railway cars
and motor buses

Samples and full
information gladly
furnished.



The PANTASOTE COMPANY, Inc.
250 Park Avenue NEW YORK

Drip Points for
Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64,000 Wet 31,400. Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company
Muncie, Ind.
Est. 1848—Inc. 1870

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches	$6.00 an inch
4 to 7 inches	5.75 an inch
8 to 14 inches	5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

R.J.

POSITION WANTED

SUPERINTENDENT transportation, qualified by wide experience, proven successful record, every phase of transportation. Successful in employe and public relations, increasing revenue, decreasing operating costs. Available short notice. Fine references. PW-167, Electric Railway Journal, Tenth Ave. at 36th St., New York.

For Sale

The following Sangamo Economy Watt Meters:

34—600 volts, 300 amp. Meters, 120 watthours per disk revolution.

28—600 volts, 100 amp. Meters, 40 watthours per disk revolution. Above meters in A-1 condition.

For Sale or Exchange

8—Westinghouse 506 Motors complete and and in good running condition, less pinions and gear cases, in exchange for Westinghouse 508 Motors.

Monongahela West Penn Public Service Co.
Purchasing Department
Fairmont, West Virginia

Sponges and Chamois

FLORIDA SPONGE CO.
11201 Cottage Grove Ave., Chicago, Ill.

EQUIPMENT of the latest type is frequently advertised for resale in the *Searchlight Section*. Don't let a limited budget stop you from buying modern cars, busses or equipment that will cut costs or improve your service. Modernize your lines throughout *now* by buying wisely from these equipment bargains.

Stretch your Budget to Cut Your Costs

FOR SALE

100 FAGEOL COACHES

SIX-CYLINDER, PARLOR-CAR TYPE

Priced At **$1000** And Up

Due to standardization of equipment on the Greyhound Lines, this company offers the above equipment at prices substantially below actual value. All coaches are in good mechanical condition.

For Particulars, Address BERNARD WAHLE, *Sup't. Of Operations*

"GREYHOUND LINES"
514 E. 34th Place, Chicago

Turning Old Cars into Cash!

Here Is How We Do It!

These pictures illustrate how we make it possible for street railway companies to turn old cars into cash.

The upper picture shows a number of cars being burned—after the railway company had accepted our offer for the scrap metal in them.

The lower picture shows our crew with hammer and torch, preparing the scrap right on the spot for the steel mills. No middleman intervenes. The scrap goes directly from the railway property to the mill.

We are not Alchemists—
But—

we turn iron and steel
into gold and silver.

L. Schiavone & Bonomo Bros. Inc.
Jersey City, New Jersey

TRACTION AND ELECTRIC LIGHT

PROPERTIES *for* SALE

THE Railway Properties serving the City of Binghamton and its suburbs together with Johnson City and Endicott on the west extending about ten miles from Binghamton, including Binghamton Railway Bus Lines operating a fleet of eighteen buses in and about the City of Binghamton, Johnson City and Endicott, and serving about 125,000 people and also the lighting property in Endicott and portions of the Town of Union will be sold under decree in foreclosure on Wednesday, May 15th, 1929 at 2:30 P.M., at the general offices of the Binghamton Railway Co., 375 State Street, in the City of Binghamton, N. Y.

The railroad property contains about 45 miles of single and double track. The equipment consists of 18 buses and 79 cars all in good condition together with all necessary railway and electric light paraphernalia including a plant at Binghamton.

Opportunity will be given anyone seriously interested in the property to thoroughly examine its records and the physical property.

Rate of fare is ten cents with four tokens for thirty cents.

Binghamton proper has a population of about 80,000 and Port Dickinson, Johnson City and Endicott making up the other 45,000.

PARTICULARS OF SALE may be obtained from WILLIAM H. RILEY,
Special Master, 375 State Street, Binghamton, N. Y.

Saving is a good habit, BUT—

Why Save Things You'll Never Use?

WHY let Mother Nature grow grass between the wheels of replaced cars? Why pile up rails, shop equipment, power plant equipment, line equipment, car appliances, road building material, etc., etc., you will never use again?

TODAY you can turn them over at a fair price. Tomorrow they will be—JUNK. Is it not the better part of good horse-sense to dispose of them NOW?

6000 other electric railway men will see your advertisements of used or surplus equipment and materials here—in the Searchlight Section of their business paper.

Some of these men—officials or executives of other lines in other parts of the country and operating under different conditions—can use what you no longer need. For an insignificant investment you can tell these others what you have. And they will buy.

One "Searchlight" advertiser wrote, "We can cheerfully recommend the Searchlight Section as a wonderful medium for reaching buyers of rails and equipment." Another—"The strongest proof that your 'Searchlight' finds its way to many readers is shown by the numerous letters we have received in answer to our recent ad."

Let us tell you the cost of advertising your used or surplus equipment and materials in the Searchlight Section. Just address a list of what you have to dispose of to the

Searchlight Department

ELECTRIC RAILWAY JOURNAL
Tenth Ave. at 36th St., New York, N. Y.

Do You Need *Good Used Equipment?*

BIRNEY CARS

All types motor equipment in excellent condition. We also have modern light weight double truck steel cars, both city and interurban types. Write for details.

POWER HOUSE EQUIPMENT

Power house equipment both 25 and 60 cycles. Fine offerings of Rotary Converters and generator sets.

BUSES

Let us tell you about our bus offerings. City and interurban types.

ELECTRIC LOCOMOTIVES SNOW FIGHTING EQUIPMENT

Air compressors, controllers and parts.

FARE BOXES

All Types
also
Shop Equipment

"Our integrity
is
your guarantee."

MOTORS

Exceptional offerings in modern motors—306CV4, G247, 264, 258 and 101B. Also large assortment of older type motors in stock.

G. T. ABEL

393 Seventh Ave., New York City, N. Y.

"Sole Distributors for SIMPLEX SAFETY DEVICES"

If you don't see the equipment you need advertised on these pages, send a list of your requirements to the Searchlight Department, Electric Railway Journal, 10th Ave. at 36th St., N.Y.C. You will be put in prompt touch with reliable sources of supply.

Send Us Your List of Railway Equipment

FOR SALE

12—G. E. 258c Motors.
4—G. E., 202 Motors.
4—G. E., 57 two-turn Motors.
All in Excellent Condition.
4—12 v. Johnson Electric Fare Boxes Registering Dimes only, with Registers.
5—12-v. Johnson Electric Fare Boxes Registering Dimes and Nickels, with Registers.

CASH PAID

For your obsolete equipment, motors, cars, track, overhead wire or entire properties. Be sure to send us your list of equipment for sale or your requirements.

J. W. GERKE

303 Fifth Ave., New York, N. Y.

We Buy

Railways in their Entirety

Our experience of over a quarter of a century enables us to pay you the highest prices.

We also buy used railway and power equipment.

We shall be glad to confer with you on this matter at your request and appraise your property without charge.

FOR SALE

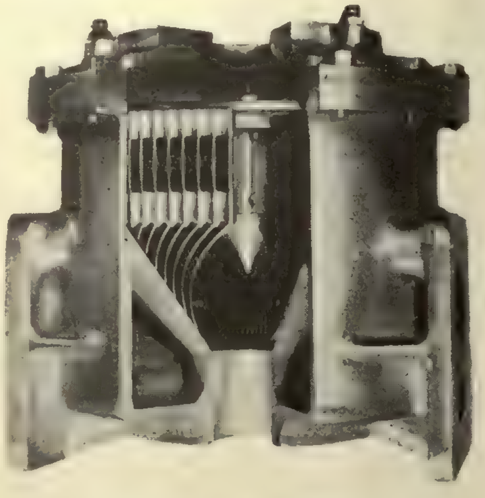
Unusual Bargains

LINE CAR—Double truck, four motor equipment, good as new.
RAILWAY MOTORS—6—203 L—G.E.
8—216-G.E.
FARE BOXES—Johnson type D for nickels, dimes and pennies.

Write or Wire for Our Prices

H. E. SALZBERG COMPANY, INC.

225 Broadway, New York City, New York



Godward Gas Generator

You can now use

Fuel Oil

in buses with the

Godward Gas Generator

National Railway Appliance Co.

420 Lexington Ave.
New York

H. A. HEGEMAN, President
J. M. PRATT, First Vice-Pres.
F. T. SARGENT, Secretary
D. J. BROWN, Treasurer

Hegeman-Castle Corporation
Railway Exchange Building
Chicago, Ill.

F. F. Bodler
903 Monadnock Bldg.
San Francisco, Calif.

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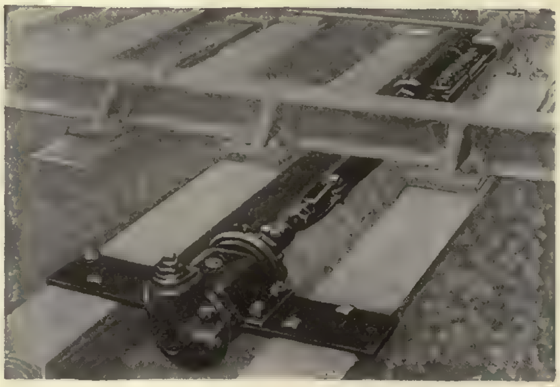
RACOR

Protect Spring Switches from Excessive Wear



Racor Oil Cylinder Dash Pot

WEAR on spring switches, that are habitually trailed through, is excessive on the inside of the points unless the Racor Oil Cylinder Dash Pot is used to retard the return of the points.

This mechanism works on the principle of the door check. It offers no resistance to the movement of the points when they are swung over by the wheel flanges but the return motion is retarded so that successive wheel flanges give a greatly reduced blow. Thus the inside of the points are protected from excessive wear and have a greatly lengthened life.

The Racor Dash Pot is sure in action and operates under all climatic conditions.

The Racor Dash Pot is particularly designed for use with the Ramapo Automatic Return Switch Stands, Styles Nos. 37, 38 and 39 and operates successfully with rigid switch stands connected to switch through a heavy type spring rod.

Send for complete descriptive information.

RAMAPO AJAX CORPORATION

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Bus Floors of J-M MASTICOKE *...are long-lasting*

THIS modern Bus Flooring is tough and resilient. Thousands of miles of travel and millions of footsteps leave it unaffected.

The long life and satisfactory service of J-M Masticoke Flooring have been well demonstrated by its extensive use on railroad coaches and Pullman cars. More and more, bus fleet owners are using it to reduce floor costs.

J-M Masticoke Flooring is safe and slip-proof. Its holding qualities are equally effective in any weather throughout its entire life—thus minimizing accidents.

J-M Masticoke Bus Flooring will not retain dust, dirt or germs because of its monolithic nature. It is easily cleaned by simply flushing with water. It dries quickly and is odorless. It insulates against the cold, and is, of course, fire-retardant.

Masticoke, being unaffected by water or acids, thoroughly protects and lengthens the life of the floor structure it covers.

Send in the coupon for full particulars.

Use J-M Masticoke for car floors, too

Johns-Manville

SERVICE TO BUS TRANSPORTATION

JOHNS-MANVILLE CORPORATION
Electric Railway & Motor Bus Division
New York Chicago Cleveland San Francisco Toronto

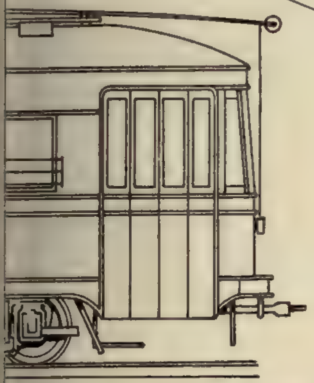
Please send me full particulars on J-M Masticoke Bus Flooring.

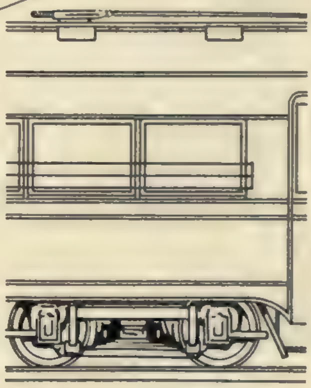
*Name*__________

*Address*__________

SB-115-4

20 Brill MASTER UNIT Cars for Porto Alegre, Brazil





Simplified Design

Rider Appeal

e twenty cars for Porto Alegre ify the general, sectional and d construction of Brill MASTER NIT Cars. They are the eight-eel, double-end type and embody simplified MASTER UNIT de-n which tends to reduce costs d the variety of replacement ts. These cars are built to with-nd the severe climatic conditions Porto Alegre.

A trim streamline appearance is accomplished by maintaining the wide single windows and the lower edges of the windows in the vestibules and upper half of the doors on the same horizontal plane. Curved lower side girders having a single sweep inward, and a skirt below the side still are other characteristic features.

Plus Operating Economy

The comparative light weight of this type car effects a corresponding reduction in the cost of power. Furthermore, the uniformity of construction simplifies the maintenance problem. Here, then, we find our South American neighbors capitalizing the advantages of new equipment and the especially advantageous features of Brill MASTER UNIT Cars. Can anyone deny that this purchase of twenty new cars is a sound investment? Can a better suggestion be made than that other operating companies in need of new rolling stock follow the example of Porto Alegre?

These Porto Alegre cars will be on exhibition at the Brill plant in Philadelphia until April 14th.

Catalog of Brill MASTER UNIT Cars now available. Write for a copy.

THE J. G. BRILL COMPANY
PHILADELPHIA, PA.

AMERICAN CAR CO. — ST. LOUIS MO.
G. C. KUHLMAN CAR CO. — CLEVELAND, OHIO.
WASON MANF'G CO. SPRINGFIELD, MASS.

Pacific Coast Representative: Rialto Bldg., San Francisco

HASKELITE

World's largest bus operator again builds HASKELITE-equipped bus bodies

THE order just placed by Public Service Coordinated Transport, Newark, New Jersey, brings this company's total fleet up to 2069 buses, the largest in the world.

This is another outstanding example of the preference for HASKELITE-equipped buses by leading operators. According to a recent check, this new order makes 1596 buses of this fleet in which HASKELITE plays an important structural part.

This preference is the natural result of the experience builders and operators have had with HASKELITE in which its light weight, added strength and low cost have been conclusively demonstrated.

Ask for details of bus and street car applications of these structural panels, HASKELITE and PLYMETL, its metal-faced companion.

PLYWOOD
HASKELITE
PLYMETL

Haskelite Manufacturing Corporation
120 South La Salle Street, Chicago, Illinois

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Railway & Power Engineering Corp., Ltd., Montreal, Toronto, Winnipeg, New Glasgow

EBJ 4 Gray

PLYMETL

ELECTRIC RAILWAY JOURNAL

ll Publishing Company, Inc. MAY, 1929 Thirty-five Cents Per Copy

Putting Miles Behind

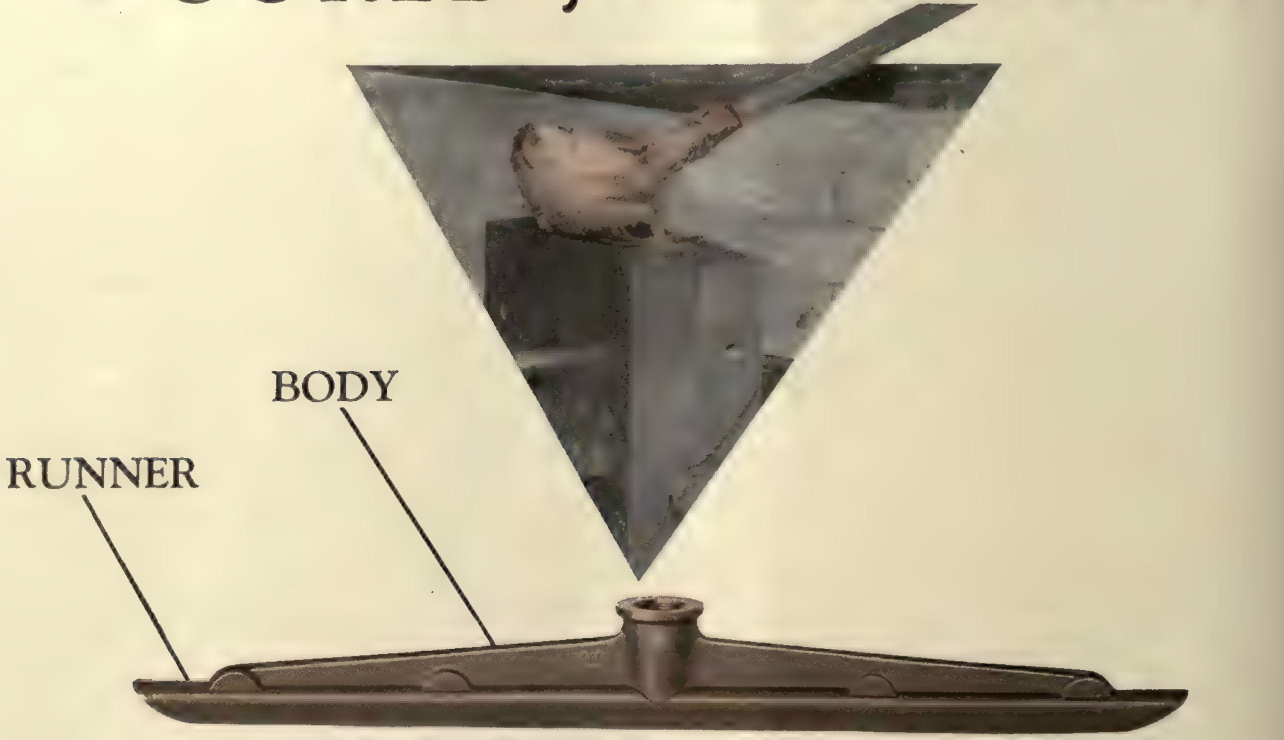
Keeping Money Ahead

Profitable miles are produced as long as buses keep taking in fares without a continual drain in repairs. This is where Timken Bearings take an active part . . . with their exclusive Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel, affording protection against thrust, shock, torque and speed as miles pass by and profits pile up. Here are found good and sufficient reasons for the ever lengthening list of Timken-equipped buses.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN *Tapered Roller* BEARINGS

POURED *for* STRENGTH



The "Champion" Trolley Ear

THE "Champion" consists of two parts--the runner and the body. The runner is made from a flat tough bronze sheet, blanked, punched and shaped. The body is made of a special high-strength alloy. The runner is placed in a mould and the body is moulded to it.

The advantages of this ear are:

1 Strength
2 Light weight
3 Easy to install; lips peen easily
4 Long life
5 Uniform thickness of lips
6 Less arcing
7 High conductivity of lips--approximately 3 1/2 times that of cast bronze ear.

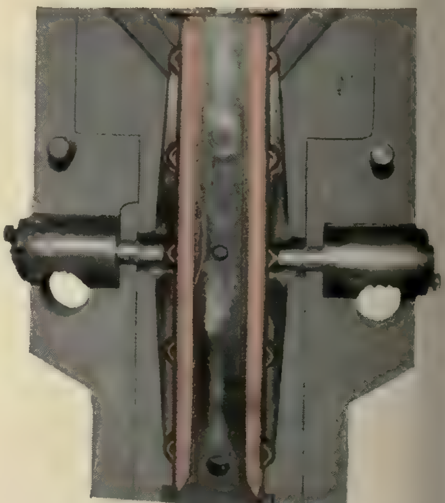


Illustration showing position of the runner in the mould, perparatory to pouring alloy.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH PENNSYLVANIA

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Electric Railway Journal

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1929

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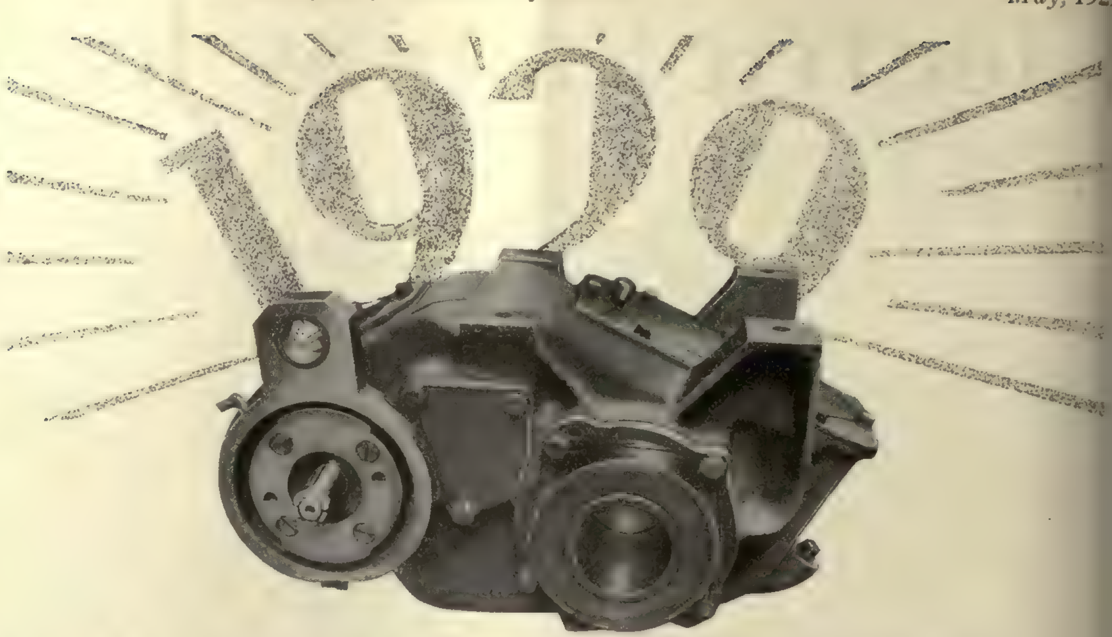

The W-N DRIVE *in Step with the Times*

EQUIPMENT, individuals, companies, all must keep in step with the trend of the times or make way for those that do.

Consider, for instance, the electric street car drive. Its first form was the spur gear and pinion. Then came the helical gear, affording a more desirable drive because of its inherent features of noise reduction and longer life.

For the cars of tomorrow that are being specified and built today, there is the W-N Drive, embodying the experience of the past, the requirements of the present, and designed to fulfill the demands of many years to come. The W-N Drive is the most advanced form of street car drive available to the railway industry today.

Having a self-contained double-reduction unit of helical gears revolving on Timken roller bearings in a continuous bath of oil, it provides higher ratios of speed reduction than any previous drive. This, in turn, permits the use of light-weight, high-speed, low-voltage motors with rapid acceleration, greater flexibility, and efficiency. With the W-N Drive, the motor is entirely spring-borne, which means longer motor life.

These important advantages, with many others, make the W-N Drive the logical equipment to put new cars in step with modern trends.

Have you a copy of DMF 5126, describing this drive?

MEMBER AERA 1929

Westinghouse Electric & Manufacturing Company
Nuttall Works Pittsburgh, Pa.
Sales Offices in all the Principal Cities of the United States and Foreign Countries

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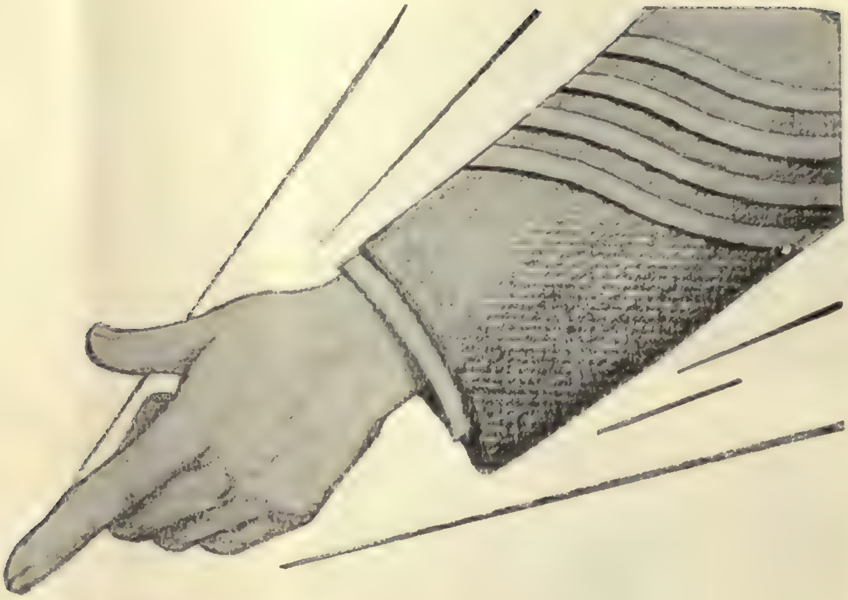
Westinghouse



SERVICE—

Determines True Cost

THE true cost of any renewal part is determined by the service which it renders and not by its purchase price.

High grade renewal parts of modern design result in economical maintenance since they give maximum service, insure dependable operation and necessitate minimum replacements.

Use Westinghouse renewal parts in maintaining your Westinghouse equipment.

WESTINGHOUSE ELECTRIC & MFG. COMPANY
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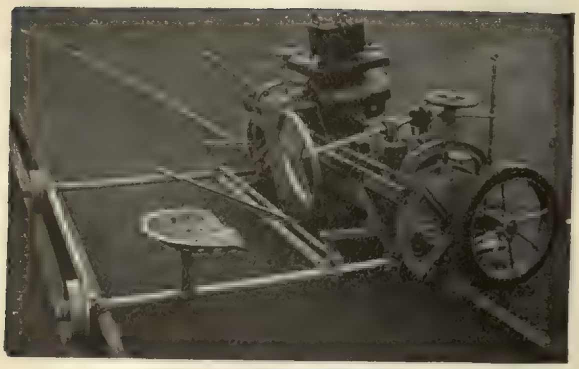
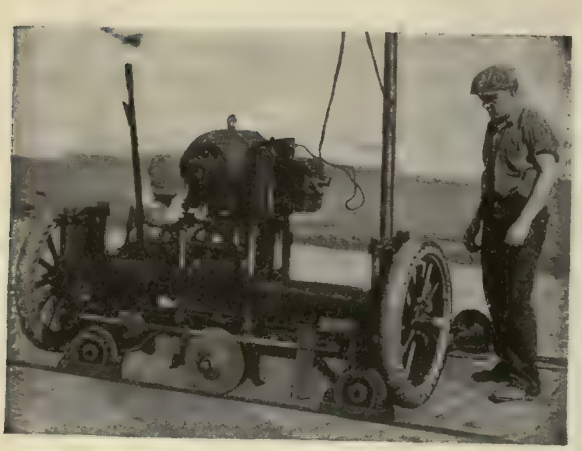
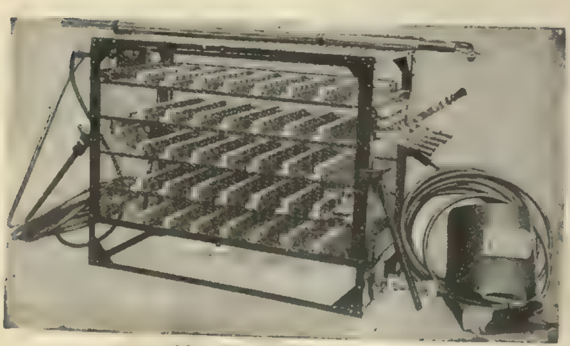


Improved Atlas Rail Grinder

Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

The best you can with what you have

The public responds to sincere effort. A road that has no money to rehabilitate its property may get it by rehabilitating its performance.

Old cars ride smoother on good track than new cars on rough track.

Rail grinding, arc welding, curve oiling are inexpensive steps toward better service... long steps.

Bulletins on
these track
improvers?

Railway Trackwork Co.

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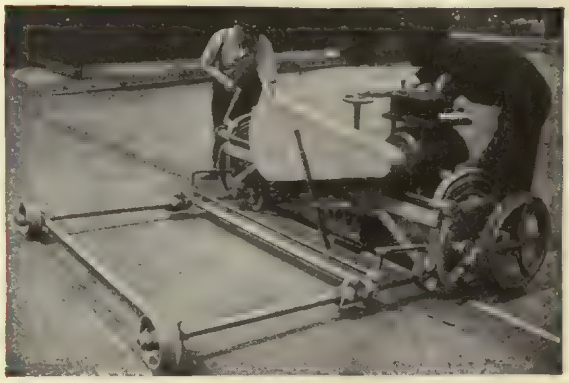
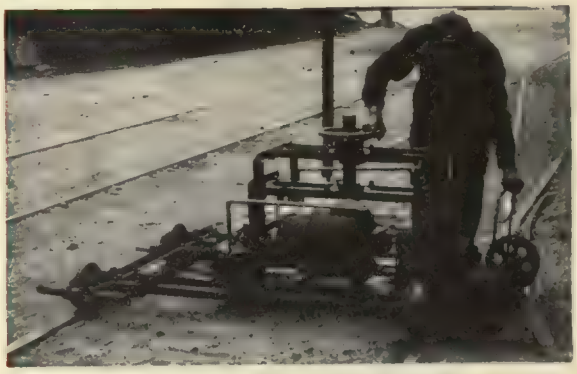
Reciprocating Track Grinder



Vulcan Rail Grinder



Midget Rail Grinder

RTW Curve Oiler

DOLLAR AND SENSE INVESTMENTS

CHICAGO Chooses

TRANSPORTATION in Chicago presents difficulties of a most unusual nature; the needs of a larger city intensify the importance of the most serious thought and consideration in choosing equipment and supplies for the correct solution of service requirements.

Particularly is this applicable to new cars. When the Chicago Surface Lines buys new cars, they must embody the ultimate in those things vital to efficient transportation. Up-to-date design is essential. Weight is an important factor. Speed another. Rider convenience still another. Schedule maintenance—or flexibility—is vital.

The 100 new cars recently purchased by the Chicago Surface Lines fully meet all of these requirements. They are the "last word" in trolley car design—and incorporate the outstanding developments in car equipment.

That the *new* O-B Dash Illuminating Headlight; the *new* O-B Featherweight (All-Steel) Trolley Base and the time-tested O-B Trolley Catcher were chosen for the new Chicago cars is a high endorsement of the correct design and modern application of these materials.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1079C

Ohio Brass Co.

NEW YORK CHICAGO PITTSBURGH ATLANTA CLEVELAND
PHILADELPHIA BOSTON ST. LOUIS SAN FRANCISCO LOS ANGELES

PORCELAIN INSULATORS
LINE MATERIALS
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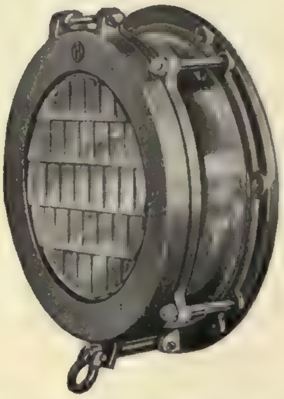
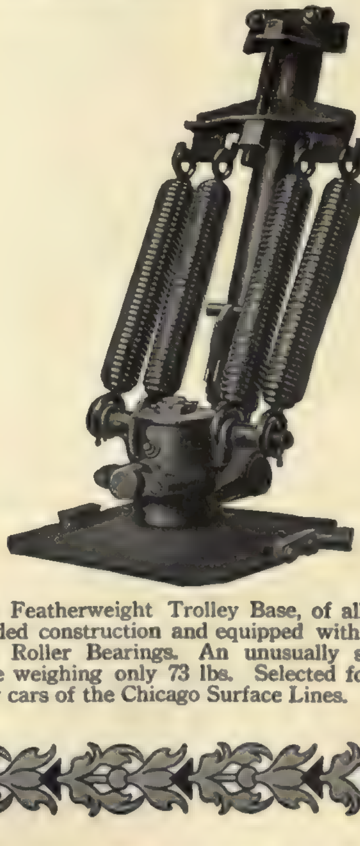
CAR EQUIPMENT
MINING MATERIALS
VALVES

The O-B Trolley Catcher, which positively prevents flying trolley poles. Selected for the new cars of the Chicago Surface Lines.

O-B Equipment



O-B Dash-Illuminating Headlight, which provides diffused track illumination as well as ample illumination of dash by use of circular side lens. Selected for the new cars of the Chicago Surface Lines.



O-B Featherweight Trolley Base, of all-steel welded construction and equipped with Timken Roller Bearings. An unusually strong base weighing only 73 lbs. Selected for the new cars of the Chicago Surface Lines.

Handling the Crowds Safely and Quickly

Large capacity buses need air brakes—for safety and economy reasons.

Adequate control, without driver fatigue, is thus assured, with the capacity to make quick stops when occasion demands.

Higher speeds may be maintained and more prompt service provided.

Street Railway Companies have proved that Westinghouse Automotive Air Brakes safeguard and promote their highway transportation.

WESTINGHOUSE AIR BRAKE COMPANY
Automotive Brake Division: WILMERDING, PENNA.

WESTINGHOUSE AUTOMOTIVE AIR BRAKES

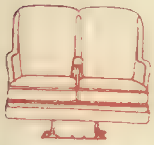
Note the Faces of your Passengers

-at the end of a long trip...

Do they look as if they would take that route again?

When a customer buys merchandise that pleases him, he will visit the same store again. "Repeat sales," they call it in commercial circles, and there are or can be "repeat sales" in railway circles too. When a passenger enjoys his trip, travelling in perfect ease of mind and body, he will *take that route again.*

A comfortable *seat* and a comfortable *arrangement* of the seats with respect to leg room and proximity to windows, lights, heaters and piping will do more to make a comfortable trip than any other single factor. Note the passengers alighting from a car arranged and equipped by Hale and Kilburn Seating Engineers. Their faces will disclose repose—freedom from fatigue and strain—a good omen with respect to future patronage from these same travellers.



H & K Rotating Chair No. 900

A comfortable seat for comfort loving travellers.

HALE & KILBURN SEATS

"A Better Seat for Every Form of Modern Transportation"

HALE & KILBURN COMPANY

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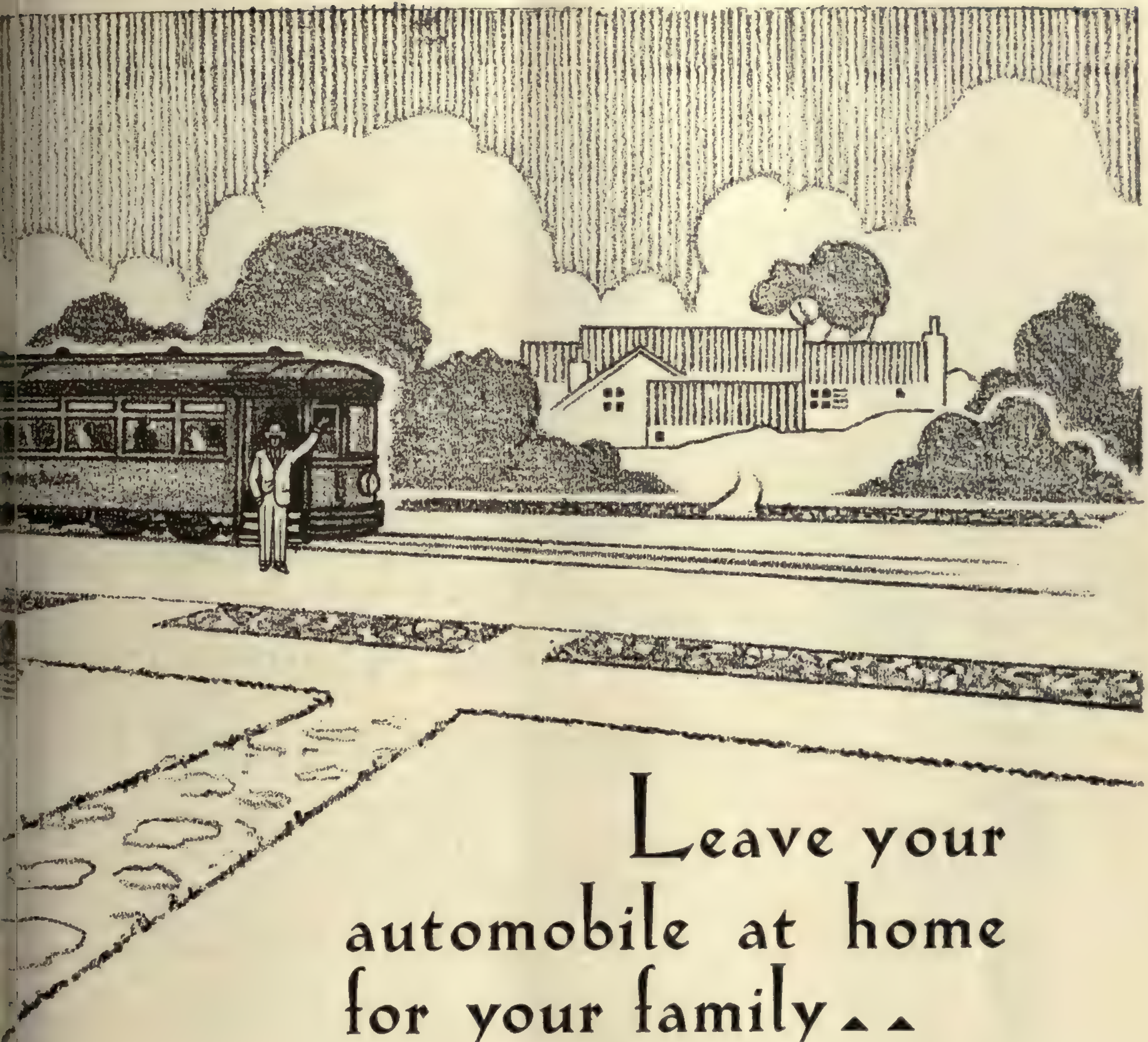

Leave your automobile at home for your family ▲ ▲

How many of us in this electric railway industry—operators or manufacturers—executives, officers and workmen, use the electric cars as much as we should? Are we not inclined to drive our own car to work, thus depriving our family of its use?

Would it not be far better to leave the automobile at home and use the electric car to take us to work every day?

We will be glad to furnish this drawing to any operator who would care to use it in his local advertising.

NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York

General Works. Rahway, New Jersey

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518 McCormick Building

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1010 Colonial Trust Building

MANUFACTURED IN TORONTO, CANADA *by*
Railway & Power Engineering Corp., Ltd.

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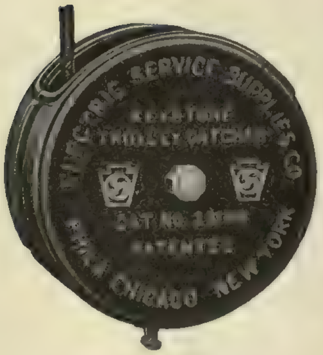
J. G BRILL COMPANY

Porto Alegre Buys
Keystone Equipped Cars

Twenty new Keystone equipped Brill cars are en route to the Ci de Carris Porto Alegrense. This South American operator wi benefit greatly by having purchased in the United States marke —where advancement in design and construction of cars an equipment has increased efficiency to such a high level. Thi transaction is evidence of great confidence placed in th suppliers.

Keystone Car Equipment is completel listed in our Catalog No. 7.

TYPE T LIGHTING FIXTURES



KEYSTONE TROLLEY CATCHERS

KEYSTONE REAR LIGHTS

FARADAY SIGNAL SYSTEMS

HUNTER ILLUMINATED SIGNS

ELECTRIC SERVICE SUPPLIES CO.

MANUFACTURER OF RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill., and 50 Church Street, New York City.

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LOTHS TAPES TUBING FI
ARNISHES OILS STICKER
LOTHS TAPES TUBING FI
ARNISHES OILS STICKER

The man in the pit sees this

This is the part of the car that gets the water, slush, dust, mud, and hard wear. Whether the man in the pit sees it often—and every time he does it costs money—depends on how thoroughly it is protected.

Car cables wound with G-E Paragon tape are prepared for long, faithful service. This tape is of sticky, waterproof material which readily absorbs varnishes and treating compounds. Its gripping quality is unimpaired by age. G-E Paragon tape is but one of the complete line of G-E insulating materials that keep cars on the line and away from the pit.

G-E insulating materials are sold only by G-E Merchandise Distributors located throughout the country who are equipped to give you prompt service. Get in touch with the G-E Merchandise Distributor near you or write to the Merchandise Department, General Electric Company, Bridgeport, Connecticut.

Insulating materials described in Catalog GEA-603 are identical with those made by General Electric for its own use. Send for a copy to the Merchandise Department, General Electric Company, Bridgeport, Connecticut.

800-505

GENERAL ELECTRIC
MERCHANDISE DEPARTMENT, BRIDGEPORT, CONNECTICUT

If Your Route

The Best Car Equipment

It will pay you to investigate the performance of G-E motors, control, and compressors

Car Equipped with GE-265 Motors and CP-27 Compressor, Detroit Street Railway

on a few of the hundreds of properties using G-E equipment.

The Detroit Street Railways, for example.

Ever since its organization, this Company has operated G-E equipment. During this time it has received such gratifying results from this equipment that it has

GE-265 Motor

specified "G-E" again and again. Twenty separate orders have totaled 603 CP-27 compressors, and eleven orders have plac 2170 GE-265 motors on this one proper alone.

The Detroit Street Railway is but one the 86 street railway companies which ha specified G-E-265 motors.

Renewal Parts

The best equipment requires the best renew parts if it is to be kept operating efficientl

Take armature coils, for instance.

Armature Coil for G-E Motor

The coils made by G.E. for G-E moto make your rewinding job extremely simpl They are exactly right in mechanical an electrical characteristics—perfectly suited t your G-E motors.

G-E engineers and scientists are constantl developing new devices and new materia to simplify your renewal problems

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

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Reliable
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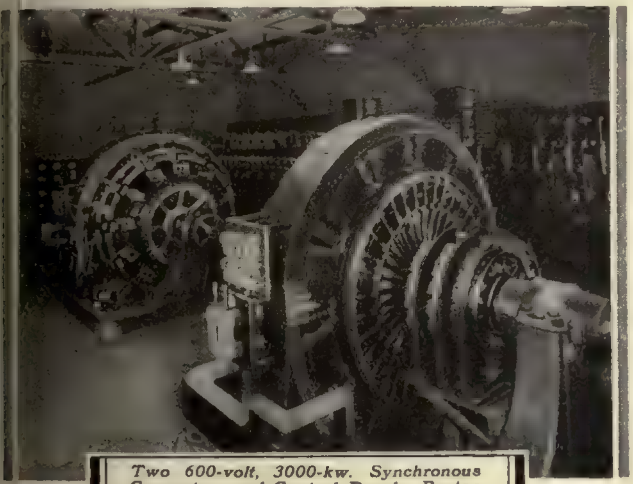

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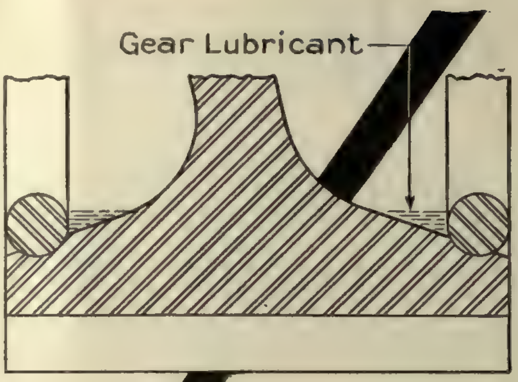

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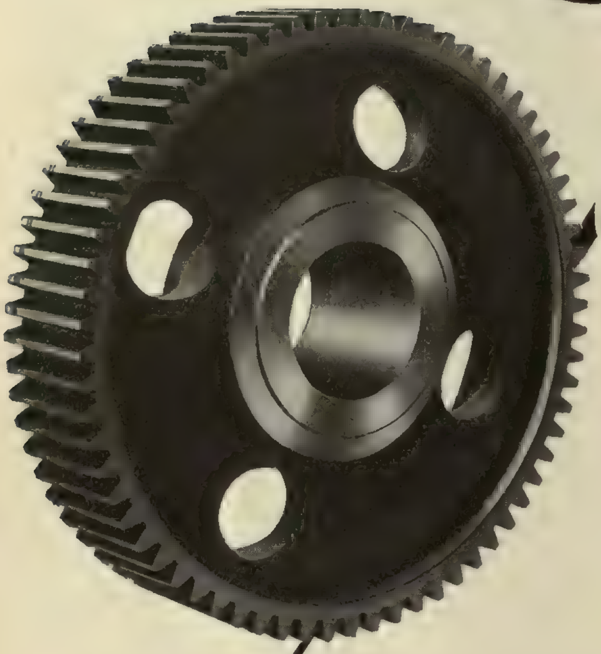

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Publishing Director

Volume 73 New York, May, 1929 *Number* 14

Transportation Problems a Challenge to Economists

GRAVE questions of economics and public policy confront the entire transportation industry of the country—railroads as well as local carriers. And since their correct solution is vital to American business, and in fact to the welfare of the entire nation, there is increasing need for attention to fundamentals. The situation grows in complexity. The present era is one in which invention and the development of natural resources have carried us forward faster and faster, and have imposed constantly changing economic conditions.

As a whole the total passenger traffic on all forms of local common carriers is standing still. This is well known. During the last eight years similar traffic on the steam railroads has declined 33 per cent. This is, perhaps, not so well known by local transportation men. No close parallel is presented by the situation which confronts these two branches of transportation, but it does suggest a number of thought-provoking analogies. The loss of less-than-carload shipments by the railroads to motor trucks, their loss of passenger business to automobiles and buses, the present public pressure for the development of inland waterways and the recent order by the Interstate Commerce Commission for joint through tariffs between railroads and barge lines; the mounting costs of terminal facilities for both passengers and freight in large cities, and the probable future competition of the airplane, have their parallels in the effects of transportation over publicly-built highways upon the interurbans, the growth of street congestion in cities, the distorted view which city planners and the public take concerning the provision of facilities for private transportation as compared with public transportation, and the many expedients that are vainly being tried in the attempt to finance adequate local rapid transit with public funds. Finally, the problems of the railroads and of local transportation become very closely associated indeed, when the physical and economic questions involved in the co-ordination of railroad terminals with the local transportation facilities of large cities are encountered.

It is not easy to foresee fully the future course of transportation development and co-ordination. The physical problems do not appear insuperable. When the question is considered from the viewpoint of economics and public policy, however, it becomes complicated indeed in its many ramifications. Despite all this there is no excuse for inaction, heated partisanship, or helpless bewilderment. The difficulties that present themselves really constitute a challenge to our ability intelligently to solve them by so directing economic forces that they shall not destroy us.

Of course, mere reiteration of the issues raises more questions than it answers, but unless the questions are both raised and clearly defined, they will not be answered. Above all, there can be no compromise with progress. The public demand for more and better and faster and cheaper transportation cannot be thwarted. At the same time there must be a clearer understanding of fundamentals in the effort to achieve results. Any tendency to dally in the consideration of principles must inevitably result in collapse of the nation's transportation facilities regardless of how brilliant may be the conception of those who plan them. Upon the economists of the nation rests the responsibility for detecting present weaknesses in our economic conceptions and for laying down as well, sound principles as the foundation upon which to rear our present and future transportation structure. Not only to the men in all branches of the industry, but to the economists as well, the country's transportation problems present a grave challenge.

Skillful Management Improves Railway Position in 1928

GREATER net income secured in the face of declining traffic and lower revenues is the outstanding result of operations revealed in the returns of 182 electric railways to the American Electric Railway Association for the calendar year 1928 as compared with 1927. Improved maintenance methods, higher average car speeds, adjustment of service to meet the traffic, development of new sources of revenue, increase of income from outside investments, use of the bus to reduce the drain of nonpaying railway routes, readjustment of the capital structure, reduction of capitalization or elimination of fixed charges have all been used to offset a loss in passenger traffic and to convert a decrease of about 2 per cent in gross revenue into an increase in the net corporate income.

Not all of the companies, of course, have been equally successful in accomplishing such results. The interurbans, in particular, as a class have been able to make little if any headway against the adverse conditions which menace them. On the other hand some of the lines in the smaller cities which a few years ago were believed to have little chance of survival are now found to be holding tenaciously to their traffic and by the most intensive efforts are developing economies and working out improvements in methods that give promise of enabling them to pay a fair return.

General conditions in 1928 were not particularly favorable to the electric railways, although there have been worse years. At the beginning of the year business was slightly depressed and employment somewhat under normal, a condition that held over from the fall of 1927. As the year progressed business picked up but in certain sections, notably the southeast, the northwest and parts of New England, conditions were below normal throughout the year. Automobile registrations increased a million over 1927, and in the fall a mild epidemic of influenza had an adverse effect on street railway traffic.

Inspection of the bus figures shows that the electric railways are making long strides forward in the development and improvement of this transportation means, although from other sources it appears that as a whole the railway-operated buses are still a long way from paying all of their carrying charges. This is due, of course, to the use made of buses by electric railways to act as stop-losses on non-paying routes and to extend transportation into lean and undeveloped territory.

Of the three groups into which the statistics are divided, city properties, interurban properties and properties comprising both city and interurban service, the third classification shows up the best. The improvement made in its net revenue was great enough to produce a similar improvement in the combined total for the properties. Furthermore, it appears from the figures that the improvement effected in this group was produced entirely by the skill of the managements without any assistance from favoring circumstances. In fact it was in this group that the reduction in operating revenue was greatest. But by intensive managerial efforts, by adapting service to the demand for it, by speeding up the cars, by more economical maintenance and by better financial management these lines were able to show a substantial improvement in the net for the year. The gains in this group, with its relatively small receipts, were sufficient to overcome in the totals the losses in the other groups. Had equal skill been possible throughout the entire industry, a still better statement would have been presented for the year's work.

Improved Maintenance Equipment Needed

EQUIPMENT for electric railway maintenance is far below the standards found in other industries. Maintenance forces are laboring under a disadvantage in this respect, and much can be done to improve equipment to lighten the labor, speed up work, reduce costs and insure more accurate workmanship. The need for improvement of maintenance tools, fixtures and machines has long been apparent, and recommendations to this effect have repeatedly been included in committee reports of various American Electric Railway Engineering Association committees. Moreover, in recent issues of ELECTRIC RAILWAY JOURNAL there have been a number of suggestions from maintenance executives regarding the need for improved maintenance equipment. Manufacturers should welcome the opportunity to enter this discussion and avail themselves of the opportunity for broadening their market for maintenance machinery.

In railway shops most of the machining operations are performed on odd-shaped pieces. As there are sometimes only a few of each class to be machined, the provision of special jigs and fixtures may not be warranted. Machine tools may, however, be improved by providing ready means of clamping the work and holding it securely. Overhead line maintenance is handicapped considerably due to the nature of the structure used. When a worn part must be renewed, it is sometimes necessary to disturb a considerable part of the supporting overhead. There is an opportunity for improvement. Likewise, there is an excellent opportunity for the development of improved tools and fixtures to eliminate hand work in the field and to speed up repairs or replacements. In the track department a large part of maintenance cost is attributable to the removal and replacement of pavement when making joint repairs. Certainly, the simplest remedy is to use the best type of joint construction available. But when bad joints do develop, attention should be directed toward ideas for cutting the cost of pavement removal.

The Clang of the Fire Bell Finally Aroused Baltimore

BALTIMORE has at least got started in the right direction on parking. It has put on the ban in certain downtown streets during business hours. The circumstances, however, are peculiar—so peculiar that they seem worthy of special attention. Traffic experts have long said that this was a step Baltimore needed to take; the railway officials have insisted that prohibition of parking on certain congested streets was necessary to prevent the convenience of a relatively small number of automobile users from interfering with the rights of all other users of the public streets; the newspapers sensed the evil of parking and the doughty Mr. Mencken, whose pen drips vitriol when he goes crusading, said in the Baltimore *Sun* recently that the use of congested public streets as free garages is a reflection on the intelligence of modern Americans. But Baltimore remained adamant; that is, the selfish had their way.

It was the clang of the fire bell that finally aroused Baltimore. Engines racing to the scene of a conflagration were able to get through the streets only after the usual traffic difficulties, but when they reached the fire the way of the crews to the fire plugs was obstructed with parked cars. The firemen had of course long recognized the parked car as an incipient menace. Now it became a real one. As Grover Cleveland used to say, it was a condition not a theory that confronted them. They put out the fire, and then they let out a roar that quickly brought action in Baltimore. It is too bad that nothing short of a threat of public catastrophe could arouse the city to exercise its common sense. The menace of the parked car is not Baltimore's alone. It exists in every city of any size.

Detroit's Subway Vote Disturbing

DETROIT voters went on record on April 1 against the $91,000,000 subway proposal submitted to them at that time. This provided for a plan of assessment that would have affected the owners of the property adjacent to the new lines. Whether or not that was the real cause for rejection does not appear, but fear of assessment does seem to have played a large part in the adverse vote. The assumption is that those vitally interested in defeating the proposition voted, while those who favored it remained at home.

As the *Free Press* sees it, men prominent in the political life of the city believe that the public will never approve a subway plan unless it is to be financed by the issue of general bonds of the community. Others are said to believe that bonds of this kind should be issued, but that the revenues of the system against which the bonds are issued should be sufficient to meet the interest and the sinking fund charges. Of course, full accord on the method to be used is hardly to be expected, but the assessment plan is the only sound one, despite the fact that it is difficult for the layman to understand.

s for the future, added means of transportation are vi to the well-being of Detroit. In fact, the city's fure is inextricably bound up in what is done about it. A matters stand now the Mayor has memorialized the Stet Railway Commission and the Rapid Transit Cmmission to draw up plans for a series of short suway routes for the downtown district to be used by th street car lines. This plan on its face would apear to throw into the discard much of the work of th Rapid Transit Commission, finally joined by the Stet Railway Commission in the proposal recently recterd. Presumably the plan which the Mayor now ha in mind will be completed in time for its submission to he voters in the fall, since he is irrevocably committed to securing some kind of transit relief for the ci. It is to be hoped that, to accomplish his objective, th assessment plan of financing—the most important sile feature of the proposal of April 1—will not be elinated.

Under the Detroit plan it was recommended that 17 pe cent of the total cost be raised by an ad valorem ta on the city at large; 51 per cent on the benefited prperty adjacent to the subway, and 32 per cent to pa for tracks and other equipment, raised by a 10-cent fa. The Council was to fix the exact proportions, an the assessors were to determine the enhancement in property values due to the subway during the five-yer construction period. At the end of the five years, th assessments were to be levied to retire the bonds. O course, the 13-mile subway included in the plan beore the voters was only part of the larger scheme upn which the Rapid Transit Commission has been at wk. Despite the need to start at once on transit imprvements in Detroit, this equitable proposal was defeted at the polls. The conclusion seems inescapable th the majority of voters had little understanding of th fundamentals of the question before them.

Humanitarian Impulse Grows in Modern Business

CONCRETE evidence that large enterprises in the United States are run along humanitarian as well a utilitarian lines is furnished by the annual reports of mny companies, but no more convincingly, perhaps, than in the annual statement of the General Electric Company. There one finds tangible instances of the practical aplication of the precepts which on occasion Owen D. Yung, chairman of the company, has reiterated.

The General Electric Company is prosperous. It has ben prosperous over a long period of years. And in its acounting policies the company is conservative almost to a fault. Its patents are carried at a dollar and its funiture and appliances, other than in the factories, are caried at a similar figure. In addition, a general plant reerve in excess of normal depreciation is set aside to pemit buildings or equipment to be replaced whenever it s found that new facilities would permit increased eficiency or economy.

But concern is here not so much with the business acmen that has produced consistent profits, as with the foward-looking policy that has been followed with respct to employee relations and the degree to which the mnagement of this vast industrial organization has recoized that even its lowliest worker is entitled to recognitin as a factor in its success. This has been put into tangible form by encouraging stock ownership by employees; through the provision of old age retirement funds, and directly through increases in the average annual earnings of employees of 126 per cent since 1914 —a period in which the cost of living increased only 62 per cent.

New York State Courts to Decide

EVENTS incident to the remanding of the Interborough Rapid Transit fare case by the United States Supreme Court to the lower court will take their course again during May after the lower court has been formally apprised of the ruling of the upper court. Just what these events will be it is difficult to say. Spokesmen for the city have been voluble, but the company has kept its peace. It is to be expected that the city will enter a plea for the dismissal of the federal court injunctions that prevent the prosecution of the city's fight in the state courts to enforce the 5-cent fare clause. City officers, as might be expected, hold that the Supreme Court's decision banning the 7-cent fare petition makes a dismissal of the injunction virtually mandatory. Even in the state court the issue may, of course, be lost, but that is by no means certain. The verdict of the Supreme Court was not unanimous.

On the probable course of events it is idle to speculate, but it is not idle to reiterate, as was pointed out in the ELECTRIC RAILWAY JOURNAL NEWS for April 13, that issues bound up in the case would appear to differentiate it from other rate actions that on their face may seem to be similar to the one in New York. The company advanced the issue that inadequate returns were shown on the combined subway and elevated properties which it operates—the former being leased from privately-owned companies, and the latter having been built largely with city funds—but the court held that the subway and the elevated systems must be treated separately. It did not, however, elaborate on the reasons for this finding.

That the Supreme Court did more than merely remand the issue to the lower courts for decision without an opinion, as sometimes is customary, is ascribed to the nature of the pleading. In so doing it did say some things that appear to offer surcease to the representatives of the city, but that is by no means certain, even though the officers of the city were quick to accept them as such. The court's rejection of the plea of the company that the fare should be adjusted to provide an 8 per cent return upon both the company and the city investment in the subways—to be divided according to the terms of the contract—was tempered with the statement that while the claim was unprecedented it "ought not to be accepted without more cogent support than the present record discloses."

As brought out previously in the ELECTRIC RAILWAY JOURNAL, matters as they now stand are best stated in the words of Justice McReynolds to the effect that the Transit Commission of the state of New York has long held to the view that it lacks power to change the 5-cent rate established by contract between the city and the company, but that "it is intended to test this point of law by an immediate, orderly appeal to the courts of the state." This purpose, the United States Supreme Court ruled, should not be thwarted by an injunction secured by the company to prevent the city from interfering with an increase in fares.

Signals Should MOVE Traffic —Not STOP I

By J. ROWLAND BIBBINS
Consulting Engineer
and HERBERT C. LUMMIS
Associate

Observations of the performance of typical signal installations indicate in a striking way the serious delay to traffic movement that results from makeshift signalling. The authors develop a series of traffic flow profiles that illustrate exactly what happens at a crossing, under variable conditions, after the "Go" indication flashes

"VANITY FAIR" recently printed a forceful story of "The City That Died of Greatness." "We are on our way; nothing can stop us," warbled the 42nd Street realtor. "Yes, but where?" exclaimed the long-suffering one. "Truly on your way, but at the dizzying rate of 1 m.p.h." Thus we of the provinces are constrained to exclaim, "So *this* is New York." All of which is merely by way of observing that our dynamic metropolis has thus far contented itself with the most obsolete traffic-signal system of any large city.

The harassed traffic head of another large city echoes: "We must immediately spend $1,000,000 for signals." But this city apparently has made no adequate engineering study to determine the right design, the exact needs, or the probable result of signaling perhaps 1,000 street intersections. Many other communities are nervously spending and experimenting, with no clearly defined objective in mind and with little intensive study of the problem before making heavy expenditures for what, in the last analysis, are strictly engineering projects.

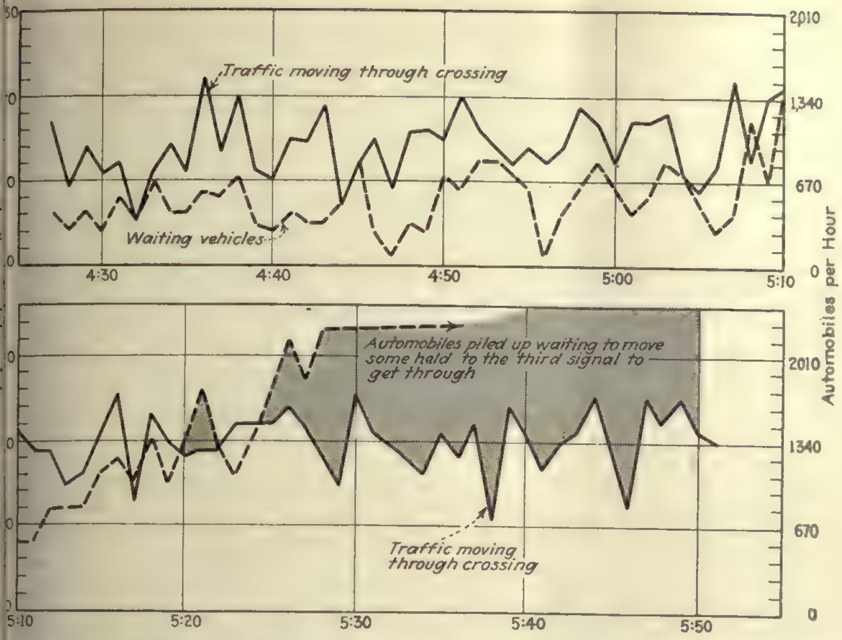
There are 30,000,000 people today dwelling in a total metropolitan area of 10,000 square miles (cities over 200,000 population). Roughly speaking, the total riding habit within these communities has steadily increased. But the demand for speed and comfort has diverted perhaps one-third of the present total volume of riding from public transportation agencies to private automobiles. The public is moving into the suburbs and demanding faster transportation. Time rather than distance has become the measure of transportation, and the 30-minute time zone still measures, in a general way, the limit of convenient residence and maximum population density. Beyond the 30-minute zone the tendency to use automobiles increases except in unusual cases like Manhattan, where "necessity riding" and lack of cheap auto storage encourage people to use the rails.

Thus speeding up the mass carriers, upon which most people have to depend, at the same time decreasing
downtown motor congestion by
moving some of the causes, has
come an outstanding problem
public interest. Express buses
pear most hopeful where rapid t
sit cannot be financed by reason
fares or benefit subsidies. But
buses are subject to defe
street planning and much the s
delays as street cars. To make
ters worse, inadequate signaling
traffic controls have become al
epidemic throughout the cou
distinctly menacing speedier tr
portation and efficiency which
industry is struggling to ach
through its modernization progr

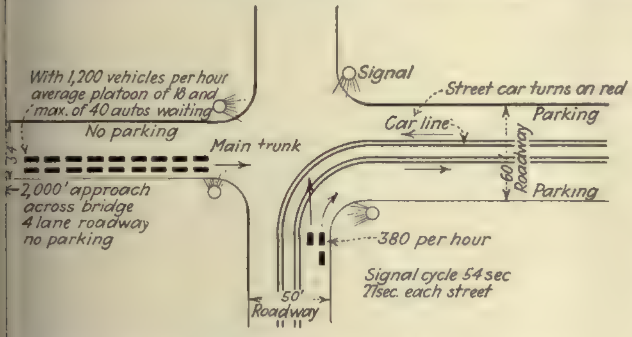
But this situation can be met if approached as a p
lem of engineering analysis and design rather tha
politics or "safety" policing alone. In the accompan
Table I, there is shown a definite example of the re
which may be accomplished by proper signal contr
comparison with present obsolete methods. By ti
signals for proper sequence traffic moved one-t
faster, there was an increase in street capacity for
stop traffic amounting to more than twice the nu
of automobiles that could get through formerly wit
stopping, and transportation speeds were increase
per cent.

SIGNALS SHOULD MOVE TRAFFIC—NOT STOP I

So long as both public transportation vehicles
automobiles occupy the same streets, any adequate
tem of control should have for its purpose both s
and time-saving for the greatest number of pe
Unfortunately, almost the entire consideration in s
installation has generally been concentrated upon
pediting automobile traffic with little regard to the
tive number of people carried by various agen
Contrary to this practice, the requirements of mass t
portation should be the starting point. To ha
rush-hour loads of our 22 largest cities, registe
nearly 4,000,000 automobiles, about 2,500,000 of t
carrying an average of 1.7 persons, would be req
(assuming a riding habit as low as 250 rides per c



g. 1—Log of vehicular movement (two-lane) through first signal of alternate-group, synchronous system on heavy traffic artery, based upon observations taken at five-second intervals and showing pile-up of delayed vehicles during rush-hour peak


With 1,200 vehicles per hour average platoon of 18 and max. of 40 autos waiting
No parking
Main trunk
34'
2,000' approach across bridge 4 lane roadway no parking
Signal
Street car turns on red
Car line
Parking
60' Roadway
Parking
380 per hour
Signal cycle 54 sec 27 sec. each street
50' Roadway

Observations for Fig. 1 were taken at this intersection

r year). In comparison, modern railway equipment, signed for handling city surface transportation and erating either as single cars or articulated units, s the equivalent actual passenger-carrying capacity from 40 to 100 automobiles.

The starting point, therefore, in designing a signal stem for a public street carrying passengers in both blic and private vehicles, is to obtain the highest average speed, including passenger stops, that it is possible make by cars or buses through a signal district during sh hours. To expedite the movement of automobiles well as that of public transportation vehicles, a two-eed wave system can generally be discovered which ll accommodate *both* public vehicles and automobiles st efficiently, so that the "set-back" of cars or buses e to loading stops can be best fitted into successive nal "wave bands" to avoid the present time loss waitg for signals, which is so seriously slowing down public nsportation rather than speeding it up. For non-rush urs, a short signal cycle permits advantage to be taken the shorter loading time and decreased traffic interrence during these hours. The commendable increased eed of all traffic through the Chicago Loop district, llowing the installation of a scientifically-designed, ogressive signal system, illustrates what can be accomshed by proper skillful design. When the requirents of mass transportation are thus adequately considered, the advantages accrue not alone to public transportation riders, but to all traffic using the streets.

NEED FOR FASTER SCHEDULES IMPERATIVE

Surface transportation in public vehicles needs to be speeded up during rush hours along main trunk line streets to 12 m.p.h. average running speed, and even faster during non-rush hours. Express buses, with minimum stop time, should approximate average automobile speeds. As street car headways are seldom closer than 30 seconds, and buses 60 seconds, even on heavy traffic arteries, it rarely becomes necessary to pass more than one or two mass transportation units across an intersection during each signal cycle. Consequently, while other traffic may accommodate itself to quite a wide range in cycle time, mass transportation vehicles need the shortest possible cycle to minimize waiting time for stop signals. But rarely indeed are these transit needs adequately considered in present signal installations. Yet it is entirely practicable when signal cycles are kept short to accommodate two classes of traffic moving on the same street at different speeds, with minimum stoppage and delay to either class of vehicles.

On the usual transit system of a circular city, an increase in speed of 1 m.p.h. will expand the 30-minute rush-hour time-zone more than 25 per cent in area. But if then a system of signals is installed, for example, along a 5-mile transit artery of ten blocks per mile, which is improperly timed so that street cars are held up by a red light for 30 seconds every five blocks, this would result in ten delays, adding 16 per cent to the running time of the line, thus absorbing all of the assumed speed increase. The cost of providing transportation service is also materially increased to no good purpose, to say nothing of the delay experienced by the public during the 300 or 400 rides per year required by the average citizen. It is idle to figure money losses, but it is very important to recognize that a large part of this economic loss can be avoided through proper signal design timing.

SIGNAL ENGINEERING INVOLVES MANY FACTORS

The technical problem of properly designing and timing signals so as to co-ordinate the effects of many shifting variables, differing in proportion for every city, street and intersection and changing for various times in the day, involves proper recognition of the following factors:

Complexities and defects of the street plan itself.
Number of blocks per mile and variable block lengths.
Width of streets, number of roadway lanes available.
Effectiveness of regulations with respect to parking.
Reasonable wave speeds safe for traffic and transit in particular districts.
Length of cycle best suited to these block lengths and speeds.
Split of cycle best suited to cross traffic and turns.
Type of traffic (classes of vehicles and density) for various periods of the day.
Volume of through traffic, cross traffic and turns at various intersections.
Pedestrian movement at critical points.
Operating characteristics of car and bus lines as to acceleration

rates, running speeds and time of passenger stops to accommodate the passenger interchange at various points and periods of the day.

Car-bus density or headways required at various periods.

It is no exaggeration to say that any comprehensive signal installation which overlooks these considerations will tend to slow down traffic movement instead of expediting it and will constitute a serious economic burden on the community.

Further, we must challenge the viewpoint too often expressed or implied that if the movement and speeds of traffic and transit are not reduced by a new signal system below what they were before the installation, satisfactory results have been secured. The time has now come to demand positive rather than passive or negative results or else change the system.

Average street speeds are now too slow. The result of properly designed signals should be to increase the average speed rather than the maximum or crest speed of moving traffic. There is a certain moderate average speed which passes the maximum volume of traffic; above and below this, less traffic gets through a given artery in a given length of time. When speeds are very high, this situation is obviously due to the physical necessity for "stringing out" of the line of traffic for increased safe braking distance. Within the limits of permissible city traffic speeds, the factor of greatest importance in determining the volume of traffic that will get through a given artery is signal efficiency and not high crest speeds.

This efficiency may best be measured in terms of either the ratio of the width of the through "time band," during which traffic moves through a signal system without stopping, to the total "Go" time at the controlled intersection, or else by a percentage of the hour given to through movement. In other words, those signal installations are most efficient which permit the largest proportion of traffic to get through without stopping. Every signal stoppage of traffic represents a "pile-up" and "set-back" to succeeding "Go" signals.

In the first column of Table I under the "alternate-group, synchronous" signal system, the time band for through, non-stop traffic at present amounts to only thirteen seconds, due to the fixed equal timing at each intersection, and the inherent characteristics of the system, although the "Go" time for the artery under observation was 40 seconds. Thus the efficiency of the system from the viewpoint of through, non-stop traffic is 32.5 per cent. The proportion of total time devoted to non-stop through traffic is only 16.3 per cent. In the same table under the "progressive non-stop wave" signal system, the efficiency of the through traffic band may be raised to 83.5 per cent and the proportion of the total hour, available for non-stop through traffic movement, is 41.7 per cent.

INEFFICIENT SIGNALS CUT TRAFFIC CAPACITY

Signal installations group themselves roughly into five classes: (1) Isolated signals; (2) simple synchronous; (3) alternate-group synchronous (2 or more blocks); (4) alternate-synchronous (single blocks); and (5) full progressive wave systems.

Except in very special cases all of the first four are inadequate to the requirements of a heavy main line artery carrying both automobile and public transportation vehicles. The simple, isolated, automatic "go-stop" signal, with no timing relation to other signal installations on the traffic artery, is entirely unsuited to expedite traffic movement. It merely stops the traffic stream periodically for the purpose of allowing cross traffic to move through. The simple synchronous or "hit run" system encourages over-speeding. In this sy all signals on a master time circuit show "Stop" or " simultaneously. When electric cars are controlle such a system, a serious power problem is develope the simultaneous starting of all cars along the stre

The alternate-group synchronous or "stagger" sy requires a rigid 50 per cent split of the signal c This is usually arranged to show successively "S Stop-Stop," and "Go-Go-Go," etc., along a given st Obviously there must be an excessive wastage in s time and capacity and the signals permit only a very percentage of time for non-stop through-traffic m ment. The alternate (one block) synchronous inst tion is best adapted for *uniform* block lengths of si eight blocks per mile. But this also requires a rigi per cent split of the cycle time, and there is no to avoid wastage of time and street capacity due to of individual signal timing.

TABLE I—COMPARISON OF ALTERNATE-SYNCHRONOUS A PROGRESSIVE SYSTEMS

Two-Mile Main Trunk—Skip Signalled (30 per cent—9 minor crossings or

	Alternate-Group Synchronous	Prog Non W
Length of cycle, seconds	80	
Cycle split along the street, seconds	Fixed 40-40	var
Width of through-traffic band, seconds	13	
Efficiency of through-traffic band, per cent	32.5	
Proportion of hour available for through traffic, per cent.	16.3	
Bus operations northbound:		
Speed through lights, m.p.h.	11	
Total running time, seconds	680	5
Running time, including passenger stops but excluding light delays, seconds	565	5
Delays due to lights only, seconds	115	
Proportion of time held by lights, per cent	20.4	
Bus operations southbound:		
Speed through lights, m.p.h.	9.2	
Total running time, seconds	854	6
Running time, including passenger stops but excluding light delays, seconds	643*	6
Delays due to lights only, seconds	211	
Proportion of time held by lights, per cent	33	
Automobile speeds (moderate traffic flow):		
Northbound, first car, entering signals, m.p.h.	18.6	
last car, entering signals, m.p.h.	14.1	
Southbound, first car, entering signals, m.p.h.	18.6	
last car, entering signals, m.p.h.	14.1	

Advantages of progressive system—Bus speed increased 20 per cent; r time reduced four minutes (round trip). Useful street capacity for n traffic increased three times. Average traffic speeds increased one-third.

*Due to more loading and fare collections southbound.

NON-STOP PROGRESSIVE WAVE SYSTEM MOST EFFICIENT

The full progressive wave system represents the efficient plan for the control of heavy traffic move and provides the most uniform speed, maximum ca and non-stop traffic flow. Such installations o from a four-wire master control circuit with adju timers at each intersection and local power supply. the green "Go" signal moves along a street at pre mined speeds just ahead of the moving vehicles, have been separated into moving platoons. For t arteries outside heavily congested districts, this s may be installed with signals only at main interse and with "Stop-Enter" boulevard signs to prote intervening points where only light cross-traffic o This might be called the "skip-signal progressive tem." It is especially adapted to meet the conditio very irregular block lengths which would otherwise impossible a true progressive system at a reas wave speed. If put into effect with reasonable spacing so that each successive signal ahead is visible, it is usually adequate for all practical needs

Observations made of typical signal installations indicate in a striking way the difference between good and bad signaling in its effect upon traffic movement. This effect is shown by breaking down the signal performance into five-second intervals. Only then is the full situation at a signal really revealed. Data covering full rush-hour periods, or an entire day, are totally inadequate for such an analysis in that they obscure the direct effect of the signals themselves upon vehicular movement. It is important to bear in mind that the time-unit of one second is the basic unit for studying signal performance, because a few seconds added to the timing here or taken off there may mean the difference between blockades and free movement. Wasted time through improper signaling is always cumulative. This is brought out clearly in the accompanying charts showing the serious pile-up that may occur.

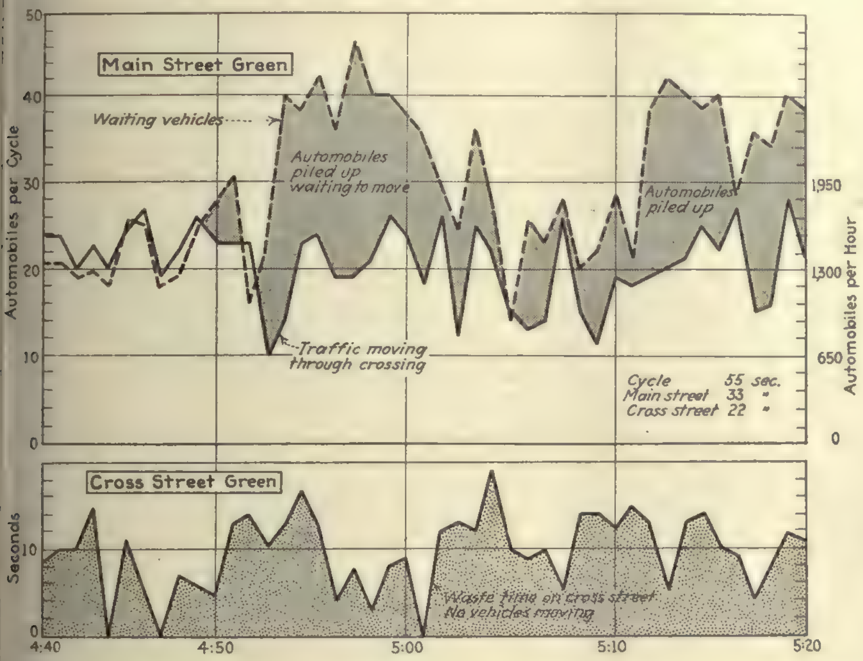
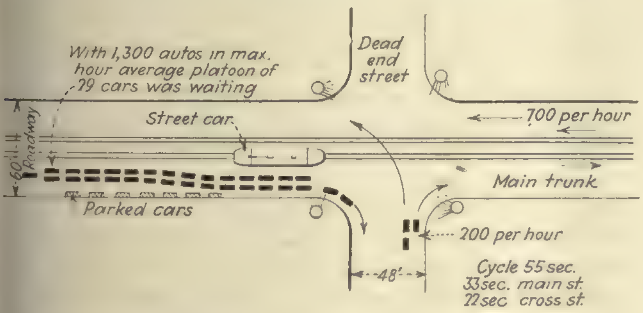


Fig. 2—Log showing effect of improper timing of isolated signal at a "T" crossing on a heavy traffic artery. The delay to through traffic and waste time on the cross street was subsequently eliminated by re-timing the signal



Observations for Fig. 2 were taken at this intersection

The data plotted in Fig. 1 were taken at the first signal of an alternate-synchronous system on a heavy traffic artery with a clear approach of 2,000 ft. The observations were made for a two-lane, outbound, rush-hour movement with a signal cycle of 54 seconds split equally for stop-go, 27-27 seconds. The vehicular traffic approaching the signal had been broken into platoons by previous isolated signals located 2,000 and 4,000 ft. ahead of the signal under observation. The chart represents, by the solid line, a log of the number of automobiles passing through the signal in each cycle from 4:30 p.m. to 5:50 p.m. The scale at the right indicates the rate per hour of vehicular flow per hour represented by this movement through each signal cycle.

Stopped Vehicles Represent Delay

The dotted line on the chart represents the number of automobiles stopped at each signal cycle, waiting to proceed through the crossing. The relatively fixed capacity of the signal, regardless of the pile-up of waiting vehicles, is of particular interest. This occurred to an extent which represented serious congestion after 5:25 p.m. Before 5:20 about one-third to one-half of the automobiles on the street were held up by this signal. But during the period of maximum congestion one-third more were held up than were put through in each signal interval. The fixed capacity limit of the signal, regardless of the number of automobiles waiting to pass the crossing, shows the effect of the cumulative delay resulting from the necessity of accelerating a stopped platoon of automobiles. In other words, the efficiency of a signal is automatically reduced when the system is such that the majority of vehicles is required to stop before proceeding through the crossing. For the signal under observation during the normal maximum movement, the automobiles already waiting for the "Go" signal just cleared the crossing. Consequently, practically every motor on the street was required to stop at this signal during this period.

The normal maximum movement was about 20 cars per "Go" signal of 27 seconds (two-lane). This represents a limiting rate of traffic flow amounting to about 1,340 cars per hour of elapsed time. Obviously, the main street needed more "Go" time, which it was impossible to provide in the alternate-synchronous system with equal divisions of the cycle time. The cross-time wastage of this installation amounted to at least 15 per cent of the cycle or 30 per cent of the total time given to the cross street. This, of course, could have been largely eliminated with a progressive system and the time then used effectively to clear the congestion on the main thoroughfare.

Isolated Signal Improperly Timed Delayed Two-Thirds of Vehicles

In Fig. 2 are shown the effects of improper timing of an isolated signal on a similar heavy rush-hour traffic movement at a T street intersection. In this instance the cycle time was 55 seconds, split 33-22 seconds. A street car line stop on the heavy traffic artery interfered somewhat with the movement of traffic in two lanes. At the upper part of the chart, the solid line indicates the number of automobiles that passed the intersection per signal cycle. The scale at the right indicates the hourly rate of traffic flow per cycle and the dotted line the number of motors left waiting at the crossing when the main artery signal changed from green to red; i.e., the number stopped and "piled-up" beneath each "Go" signal. During two 10-minute periods, the waiting cars piled up to more than twice the number passing the signal at each "Go" period.

The highest points on the solid line in the upper part of the chart measure the limit of capacity for this signal; i. e., about 25 automobiles per cycle of 55 seconds (33 seconds of "go" indication), or about 1,640 automobiles per hour. Prior to the location of the automatic signal at this point, a manual semaphore operated by a skilled officer passed as high as 400 autos in fifteen minutes or at a rate of 1,600 vehicles per hour, because he was able to vary the length of the signals with the traffic flow. The cumulative congestion indicated in Fig. 2 was thus avoided.

The waste time on the cross street is observed by the lower curve in Fig. 2. Here the solid line shows the number of seconds in each cycle, with the cross street light showing green, but during which "Go" time was no cross-traffic moving. Most of the time allotted to this cross street was for left turn movements; necessary, but relatively small in number. This wastage averaged more than one-half of the total cross street "Go" time of 22 seconds per cycle. Since the observations in Fig. 2 were made, the hold-over to succeeding cycles at this point has been practically eliminated by changing the main artery "Go" period from 60 per cent of the total cycle to 70 per cent, illustrating the sensitiveness of signal timing.

Comparative Analysis of Three Types of Signals

An illuminating analysis of the volume of traffic which is actually passed by various types of signal installations for varying conditions of traffic movement, is given in Fig. 3, which shows graphically a series of profiles of the traffic flow by five-second intervals. Curves A, B, and C, are plotted for the same signal and crossing as the traffic log in Fig. 1. These observations were taken at the entrance throat of an alternate-synchronous system. Curve A represents the normal rush-hour profile. After ten seconds of "Go," the traffic tapers off to the "straggler" movement at the end. Curve B shows the condition at the same point after 5:25 p.m. (see Fig. 1), when saturation had been reached and more automobiles arrived at the signal per cycle than could be passed. It will be noted here that the delay resulting from the need for waiting automobiles to accelerate, after the signal flashed green, had the effect of retarding the movement so that it was not until six seconds after the "Go" signal flashed that those motors were able to clear the intersetcion. As the traffic stream got under way, the rate of flow rose to four cars per five-second interval at the end of fifteen seconds. Then, the delay again resulting from the "stringing out" of motors farther back in the platoon of waiting vehicles, caused the rate of flow past the signal to drop again to about 3½ cars per five-second interval at the end of 25 seconds. Finally, as the traffic got well under way, cars crowded through fast enough by "running the amber" to raise the five-second rate of flow sharply to about 4¾ cars in the last interval, whereupon the signal flashed "Stop" and those unable to get through were forced to pile up waiting for the next green signal.

Curve C is for selected large platoons averaging sixteen waiting autos during the period of observation. This represents the rate of flow when cars were moving freely through the crossing without congestion, and nevertheless in sufficient volume so that there was less waste of "Go" signal time. It will be noted that the curve here is fairly flat topped, but there will always be some delay in flow at the beginning of the cycle because of the slo acceleration of stopped vehicles. The rate of flow aft ten seconds, however, holds fairly uniform at four 4.5 cars per five seconds.

Similar studies were made for the isolated signal Fig. 2. Curve D shows the rate of flow of select maximum platoons for this signal, which is also a fla topped curve. Here, the average rate of flow was autos in 40 seconds, or about 1.5 seconds per vehic With 70 per cent of the time given to the main stre this signal has an output of 1,700 autos per hour, f two-lane movement and an average pile-up of twen autos.

Alternate-Synchronous System Inefficient for Heavy Flows

Curve E is the profile of traffic flow in the middle an alternate-group, synchronous system and at the seco signal of a two-block group timed in unison. Here t platoon peak, moving up from the first signal of t group, arrives late, and practically one-half of the "G time and street use is wasted, only stragglers or t turns from cross streets appearing in the first fifte seconds. There is no help for this wastage in this gro staggered arrangement. It is likewise obvious from t profile that the cycle is too long for the traffic.

These studies indicate the capacity of signaled interse tions where traffic flow is stopped. This "throttlin effect occurs at the first signal of any signaled zone and every isolated signal and is the cause of the slow avera speed and low capacity of the synchronous and alterna synchronous systems in which the flow of traffic is inte rupted many times during its passage through the si naled section. Only when signals are progressively tim so that traffic can flow through at a predetermined ra of speed without stopping, can this wastage of time a street capacity be largely eliminated. On account of t throttling effect shown here, the first or entering sig should always be at a fairly light traffic intersection, least a block or so preceeding the first heavy point. Th there will be a smooth flow in uniform moving platoo instead of the usual hit-and-run or caterpillar-like acti of the traffic streams.

When the signal cycle time and split are fixed a inflexible, it is quite clear that the volume of traffic th can pass is automatically limited and is not increased increased pile-up or pressure of vehicles. In fact, t congestion thus caused actually tends to cut down t volume that can pass in a given time, due to the dela resulting from the need of accelerating waiting grou of cars that have been stopped. Any signal system, be most effective on heavily traveled arteries, should capable of timing adjustment for the heavy traffic rush-hour conditions and speeded up during non-ru

Long Cycles a Common Evil

Since any type of signal system has the effect of c ting the traffic stream into groups of cars or platoons, that cross traffic can pass during the intervals, it is qu evident that the groups or platoons and the tendency pile up and delay these platoons will be decreased in si as the signal cycle is shortened. Disregarding the del to cross traffic from long cycles, it is the confusion the pile-up and the extra acceleration time required, wh a large number of cars is held up, that slows down t main line movement. Short cycles are also a distinct a to street cars and buses in making time.

Stragglers are the bane of efficient street usage. T hief cause of unnecessary delay of traffic under manual gulation by police is the holding of a crossing open for tragglers. In general, the shorter the cycle, the less this astage, but it can be entirely eliminated only by intensive raining of traffic men.

Possibly an entirely new system of combined automatic, manual-progressive wave will have to be developed; that is, a wave system with superimposed manual ontrols to vary the cycle division slightly at any time that this becomes necessary to relieve impending jams. It is quite probable that in central district traffic control, a combination of both wave signals and highly trained officers will continue to be needed, particularly when a great number of pedestrians require control. This seems both logical and necessary under certain conditions of traffic.

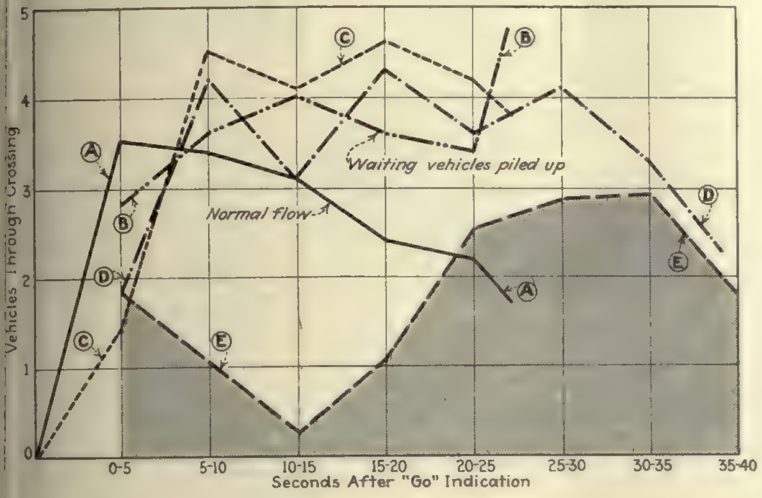
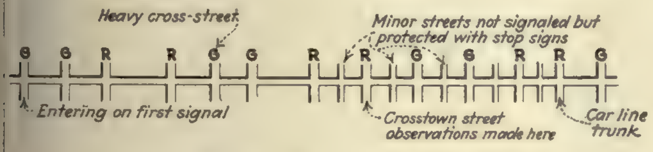


Fig. 3—**Profiles of traffic flow by five-second intervals for various types of signals and traffic conditions**

Curves A, B, C are based upon observations at the first signal of an alternate-synchronous system, timed 27-27 seconds (54-second cycle). "A" is the traffic flow during normal rush from 4:27 to 5:22 p.m. "B" represents the flow through the crossing when waiting platoons were larger than the signal could pass. Curve C is plotted from selected maximum observations under conditions where all waiting vehicles cleared the crossing. Curve D represents selected maximum results at an isolated signal on a heavy trunk street, timed 39-18 seconds (57-second cycle). Curve E illustrates the situation at the second intersection of an alternate-synchronous system on a heavy traffic street, with the signal timed 40-40 seconds (80-second cycle).


Heavy cross-street
Minor streets not signaled but protected with stop signs
G G R R G G R R G G R R G
Entering on first signal
Crosstown street observations made here
Car line trunk

Alternate-group, synchronous light system

Separate Pedestrian Signals Unnecessary

It is quite common, particularly in small cities, to provide separate periods on the signal system for pedestrian movement. In the great cities there is constant conflict between the consideration of safety on the one hand and the pressure of traffic on the other.

From the time analysis presented here, however, it seems quite clear that street time is too valuable, and the necessity of expediting the movement of mass transportation vehicles is too great, generally, to justify the reservation of a separate period for pedestrian movement. This would need to be at least fifteen seconds or 25 per cent of a normal 60-second cycle. With twelve seconds of green signal, pedestrians walking at the rate of 4.5 ft. per second should clear comfortably the widest six-lane street—54 ft. roadway—and have three seconds green-amber for additional safety. With wider roadways, center safety zones should be provided. From a practical point of view this separate period is usually out of the question. Pedestrians must be educated and, if necessary, constrained to move with the "Go" traffic. But their patience should not be overtaxed by long cycles compelling them to wait—in exaggerated cases well illustrated in New York—three or four minutes at a single crossing. A considerable proportion will not obey any signal.

When to Begin Signaling

While much depends upon the traffic characteristics, volume and hazard at each intersection, it appears that today many signals have been installed long before they are really needed, except perhaps in rush hours. Once installed, they are continued in operation, usually without change in timing, from dawn to late evening. The maximum hour or half-hour traffic should control signal operation, measured in terms of the heaviest traffic in *any* given direction, as well as the *total* traffic of the intersection. The analysis of the time-unit data herein presented and street conditions observed seems to point to a minimum limit in very round numbers of 500 to 1,000 vehicles in one direction per hour, two lanes, at normal intersections. This is a much higher density than observed in many new signal installations, even during rush hours.

The sensible plan, in starting a signal installation, would appear to be to signal a heavy traffic street only at critical crossings where vehicles or pedestrians find difficulty in crossing the main traffic, i.e., the skip signal plan. The street should be so waved with a signal ahead always in sight so that additional intersections could later be "cut in" upon the same control circuit.

It appears entirely indefensible to install signals merely to save policemen, especially signals of an obsolete or inefficient type which must inevitably react upon and depress city transportation speed. The full-wave system or none seems imperative today for heavy arteries.

Do High Buildings Cause Traffic Congestion?

One hundred and fifteen years ago the traffic problem was troubling London!

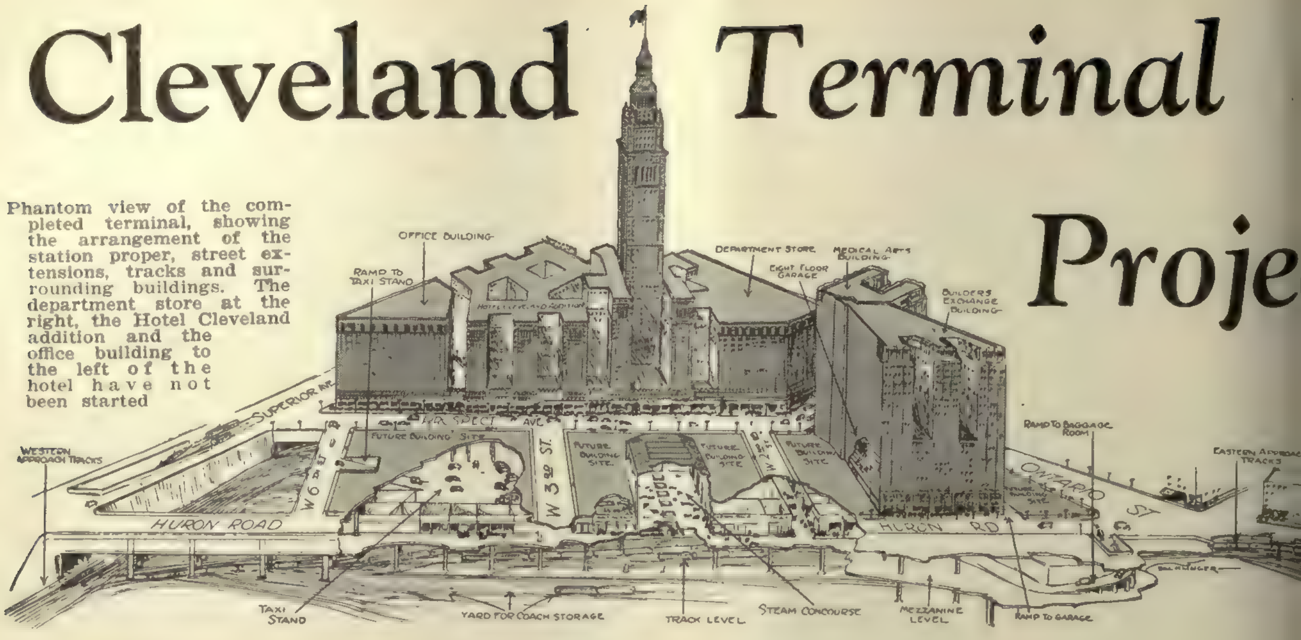
An outstanding English jurist, in a now famous decision, said:

"The King's highway is not to be used as a stable yard."

One of the industry's outstanding transportation engineers and traffic experts presents amazing new facts on the traffic problem.

**Read This Remarkable Article
Next Month**

Cleveland Terminal Proje



Phantom view of the completed terminal, showing the arrangement of the station proper, street extensions, tracks and surrounding buildings. The department store at the right, the Hotel Cleveland addition and the office building to the left of the hotel have not been started

Development includes union station, designed for rapid transit lines as well as steam roads, 17-mile electrified right-of-way and 52-story building. Co-ordination of all transportation facilities in metropolitan area through new holding company proposed

LONG handicapped by its inaccessible, ill-appearing railroad stations and by the lack of rapid transit facilities, the city of Cleveland soon will be able to boast of one of the largest and finest railroad terminals in the country. It may also have, in the metropolitan area, a completely co-ordinated transportation system, including steam railroads, rapid transit lines, interurban railways, street cars and motor buses. The Cleveland Union Terminal and 17-mile electrified right-of-way are rapidly nearing completion and will be in service at the beginning of next year. The co-ordinated transportation system, however, is still very uncertain. A number of proposals have been made and one, the proposal of the Van Sweringen interests, is before the Cleveland Railway stockholders for their approval and the deposit of stock.

Although the Terminals Company has designed the station to accommodate commuter trains and has allowed for extra tracks along the electrified line, they have made no definite announcement of an extensive rapid transit plan. It is known that they will operate into the terminal the line to Shaker Heights, which at present reaches the Public Square over city streets, and that another line is being projected along the Nickel Plate right-of-way, but even the details of these two lines relative to stations, service, etc., have been withheld. The Van Sweringen proposal now before the Cleveland Railway calls for the co-ordinated ownership and operation of the Cleveland Railway's property and the rapid transit facilities, existing and proposed. This would be effected through the formation of a holding company, known as the Metropolitan Utilities, Inc., which would acquire ownership of the Cleveland Railway, the Cleveland Traction Terminals Company, the Traction Stores Company, the Cleveland Interurban Railroad and the Cleveland & Youngstown Railroad. The Cleveland Traction Terminals Company holds a lease from the Cleveland Union Terminals Company, giving it exclusive rights in the
electrified terminal zone and als
the concession area in the termi
The plan, which would give the V
Sweringen interests complete c
trol of all the local transportat
services in greater Cleveland,
been approved by the directors
the Cleveland Railway, but will
become effective unless 50 per c
of the stock of the railway is
posited with the Cleveland Tr
Company.

Should the plan go through Cle
land will have a completely co-or
nated system of transportation fa
ities, including street cars, motor buses and rapid tra
lines. The advantages of such a system to both
citizens of the city and the transportation company can
be fully estimated. It would enable the combined int
ests to serve the public in the most economical a
efficient manner and would give the public a maxim
of service. It has been clearly demonstrated in
transportation field that competition is extremely destr
tive of the operating companies and that eventually
public suffers from poor service.

Before the Van Sweringen proposal was made to
Cleveland Railway, the railway engaged the services
Parsons, Klapp, Brinckerhoff & Douglas to make
intensive study of transportation requirements in
metropolitan area of Cleveland. The firm recommen
a comprehensive system of rapid transit embracing
entire area, and in addition recommended that the str
railway cars in the congested areas of the city be pla
beneath the surface and operated into an undergrou
terminal in the Public Square, appropriately connec
to the rapid transit terminal in the Union Station. T
routes, all of which terminate at Public Square T
minal, are as follows: (1) The Nickel Plate right-
way from Dille Road; (2) The Nickel Plate rig
of-way from Rocky River; (3) The Shaker Heights l
from Brainard Road; (4) Euclid Avenue from E
120th Street, or as an optional route, Euclid Bouleva
from its intersection with the Nickel Plate right-of-w

By **CLIFFORD A. FAUST**
Assistant Editor
Electric Railway Journal

Nearing Completion

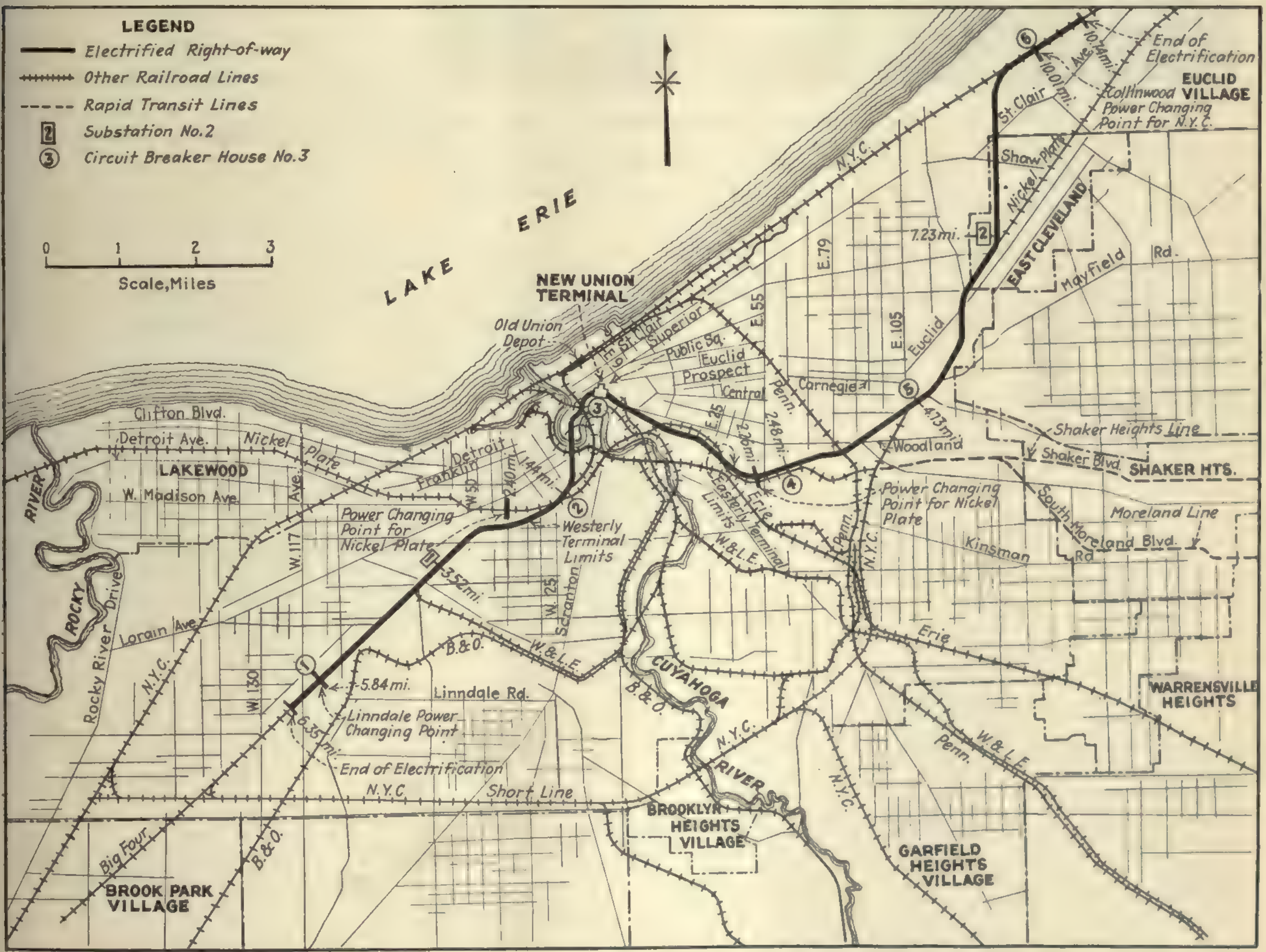
to Euclid Avenue, and thence via Euclid Avenue; (5) St. Clair Avenue, from Woodworth Avenue and the Nickel Plate right-of-way along Woodworth Avenue to St. Clair Avenue and thence via this avenue; (6) Big Four Railroad right-of-way from Linndale; (7) West 25th Street from Brook Park Road, and (8) Erie Railroad right-of-way from Warrensville Center Road.

The Brinckerhoff report recommended that the costs of subways or elevated structures, along the routes similar to those indicated by items 4, 5 and 7 in the schedule of rapid transit routes, should be borne approximately as follows: one-half by a special assessment upon the property benefited, one-fourth by general taxation and one-fourth by the riders using the facilities. The cost of the other routes should be borne by the Van Sweringen interests, according to the report. The cost of equipment necessary to operate, including track structures, electrical conductors, power facilities, etc., should be borne by the operating company, it states. The report recommended that the Nickel Plate right-of-way to the east, which is about ready for the operation of rapid transit, be selected as the first route and that the Nickel Plate route from the west to the east be made the backbone of the system. The plan described in the report was developed for a single unified system of rapid transit, surface cars and buses, with convenient interchange of passengers at transfer points.

No action will be taken on the proposed routes in this report until the Cleveland Railway stockholders indicate whether or not they wish to accept the Van Sweringen proposal. Van Sweringen executives have declined for the present to comment on the proposed routes.

ANOTHER COMPANY OFFERS SUBWAY PLAN

Opposition to the formation of the Metropolitan Utilities, Inc., has been offered by the Cleveland Subway Company, backed by the Equitable Trust Company of New York. Raymond T. Cragin, spokesman for the company, has offered to build subways to be owned by the city of Cleveland and operated by the Cleveland



The electrified zone extends from Collinwood on the east to Linndale on the southwest, a distance of 17 miles. The present routes of the New York Central, Nickel Plate, Big Four, Baltimore & Ohio, Erie and Wheeling & Lake Erie and how these roads will or will be able to tie into the new right-of-way are shown

Railway. He advised Cleveland banks to delay the deposit of trusteed Cleveland Railway stock under the Metropolitan Utilities offer, claiming that terms more favorable to the stockholders may be made by the Cleveland Subway Company. The proposal of Mr. Cragin has been ignored by the City Council, and probably will not gain much favor over the other proposals, even though he is backed by powerful monied interests to carry out his plans.

While proposals are being made for rapid transit systems, subways, etc., the Cleveland Union Terminals Company is making rapid progress on its terminal project and electrified right-of-way. The New York Central Railroad, the New York, Chicago & St. Louis Railway (the Nickel Plate) and the Cleveland, Cincinnati, Chicago & St. Louis Railroad (the Big Four) will be the guarantor users of the station, while three others are likely to come in as rental users.

Work is progressing rapidly on the Union Station proper. This view shows a portion of the station construction with its two levels below the street

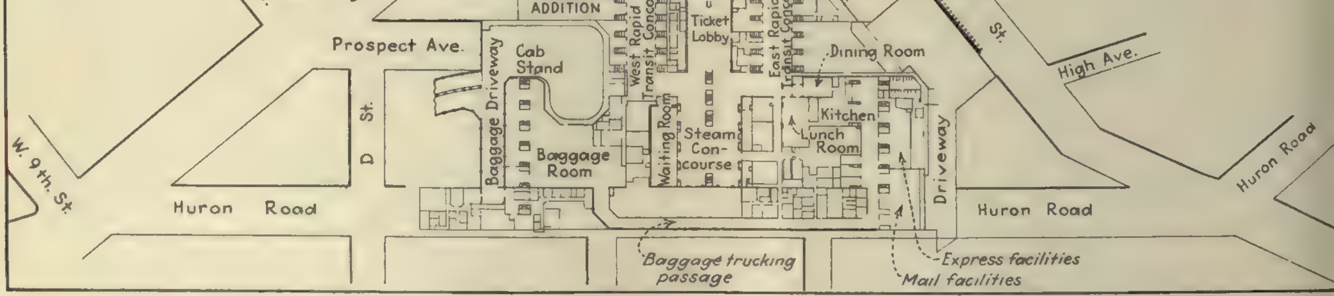
View of the terminal area from the west

This view shows the Public Square at the left, the Cleveland Hotel, the Terminal Tower Building, the 100-ft. Prospect Avenue extension, the roof of the station proper and the steel work for the Huron Road extension on the right. The raised part of the station is the roof of the main steam concourse.

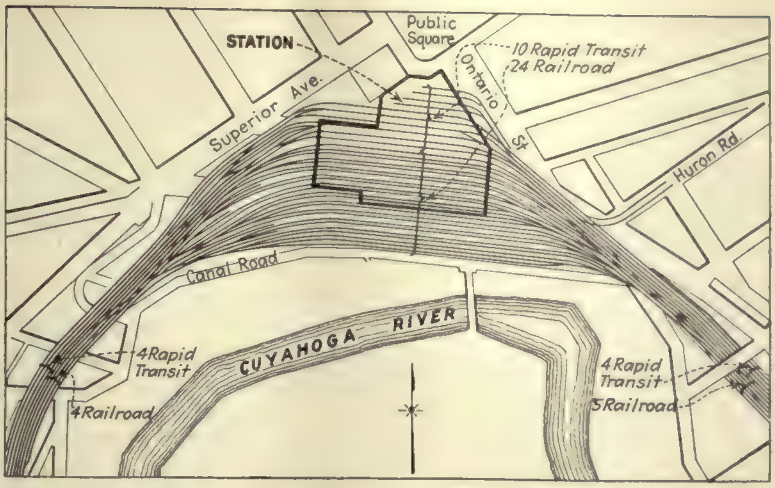
It has been reported that both the Baltimore & Ohio Railroad and the Erie Railroad will come in and though no official announcement has been made it is almost a certainty that they will enter the new station.

The Wheeling & Lake Erie is the third railroad which no doubt will use the terminal. It has petitioned the Interstate Commerce Commission for the right to abandon its station and if successful will come in. With these six railroads using the Union Station, only one other passenger steam railroad in the city would not be in—the Pennsylvania.

The importance of having these six railroads using the station adjacent to the Public Square of Cleveland is



Floor plan of the station, showing how the steam railroad and rapid transit passengers are to be segregated difficult to estimate in its true proportion. The city has long been compelled to use inadequate stations, located at inaccessible points and not convenient to the business section of the city. The new development is certain to create a new industrial growth in Cleveland and will help to establish its prestige as one of the foremost cities in the country.



The initial track layout at the station calls for six rapid transit tracks and 22 steam railroad tracks, twelve of which will be used for the station, one for a by-pass and nine for a yard. The final layout will have ten rapid transit tracks and 24 steam road tracks

PRESENT ROUTES

Passenger trains of the New York Central now operate over the Lake route from the eastern part of the city to the Union Station, continue for a short distance along the lake after leaving the station and then go in a southwesterly direction through the city. The freight trains, however, are shunted over the Short Line, which joins the main line in the southwest part of the city and at Collinwood on the east. Under the new plan passenger trains from the East will change locomotives at Collinwood, and then proceed over the new electrified right-of-way to the union terminal. They will then continue to Linndale, where they will change to a steam locomotive again. Trains in both directions will use one locomotive between the easterly limits of the electrified zone and the westerly limits.

The station is approached from the west by a viaduct two-thirds of a mile long, extending completely over the Cuyahoga flats

The Nickel Plate route at present leaves the lake east of Cleveland, goes inland approximately 2 miles and then follows the Cuyahoga River to its station. Going west the route approaches the lake front again. When the new terminal is in use, the Nickel Plate westbound trains will change locomotives at a point 2.26 miles east of the station. The steam locomotive for each train will pass over the present line of the railway and wait for its train at the westerly power changing point, 2.40 miles from the station.

The Big Four, which terminates its line at Cleveland, will continue over the same route as at present and will change from steam to electric power at Linndale, 5.84 miles southwest of the station. Should the other three railroads come in to the terminal, the Baltimore & Ohio, the Erie and the Wheeling & Lake Erie, the physical connections can be made quite easily. All three roads come into Cleveland from the south and pass near the easterly approach of the electrified right-of-way.

The electrified zone is 16.58 miles long, extending 10.74 miles on the east to Collinwood and 5.84 miles on the southwest to Linndale. It uses the tracks of the New York Central and the Cleveland Short Line, the freight line of the New York Central, from Collinwood to the juncture with the Nickel Plate at East 105th St. It then uses the Nickel Plate right-of-way to the easterly terminal limits near East 40th Street. The easterly approach to the station of the terminal zone proper passes to the southwest of Pittsburgh Avenue, Broadway, Orange Avenue and Ontario Street. The terminal zone extends on the west to West 37th Street, making a total distance between the limits of approximately 4 miles. The westerly approach is made through a cut in the

The easterly approach to the station is located at the immediate left of the street shown in this view. This required a deep cut and the construction of high retaining walls

bluff overlooking the Cuyahoga flats and over a viaduct two-thirds of a mile long, passing over the Cuyahoga River and flats. The Big Four right-of-way is used from the westerly terminal limits to Linndale on the south. Additional tracks are being added on the Short Line, Nickel Plate and Big Four rights-of-way to handle the increase in number of trains over the new route. This work required a number of cuts and fills and also the widening of several bridges. The elimination of all grade crossings along the Nickel Plate between Kinsman Road and East 93rd Street required the construction of eight bridges.

Overhead Catenary to Be Used

Power will be purchased from the Cleveland Electric Illuminating Company and delivered from two independent sources to two semi-automatically controlled substations, one located 3½ miles west of the terminal and the other 7¼ miles east of the terminal. These substations will supply 3,000-volt direct current to an overhead catenary construction. In order to equalize potential, circuit-breaker houses are provided at six points.

Portion of the Culberson cut, part of the easterly approach to the station. It was necessary to make several large cuts and fills for the electrified right-of-way

Substation No. 1, located west of the terminal, will contain three 3,000-kw. synchronous motor-generator sets. Each set is driven by a 3,600-kva., 11,000-volt, 60-cycle synchronous motor, running at 360 r.p.m. On either side is a ten-pole, 1,500-kw., 1,500/3,000-volt generator, the two generators being connected in series to supply 3,000 volts to the outgoing feeders. Six 11,000-volt, three-phase, incoming lines are provided for this station and six 3,000-volt, 2,000-amp. direct-current feeders for the outgoing lines.

Substation No. 2 will contain two motor-generator sets, with provision for installing a third later. It will have four incoming lines and six outgoing 2,000-amp. direct-current feeders. Both substations will be of the unattended type and will be equipped with complete automatic control for the motor-generator sets and all of the auxiliary apparatus. The supervisory control system will be centered in the power dispatcher's office. The electrical equipment for the substations and circuit-breaker houses will be supplied by the General Electric Company.

The locomotives selected for handling trains in and out of the terminal have a total weight of 204 tons with 150 tons on the driving wheels. They are 80 ft. long, inside the knuckles, and 13 ft. 2 in. high, from rail to cab roof. The rigid wheelbase is 15 ft. and the total wheelbase 69 ft. A total of 22 locomotives of this type are to be built for the initial operation. The electrical equipment will be supplied by the General Electric Company and the mechanical parts by the American Locomotive Company. Commonwealth Steel castings will be used for the running gear and cab underframe.

The service calls for the handling of Pullman trains weighing as much as 1,275 tons trailing, the equivalent of seventeen 75-ton cars. The six twin-geared driving motors using 3,000-volt direct current will have a total rating of 2,900 hp. at the one-hour rating and 2,465 hp. continuously. The tractive effort at the one-hour rating will be 29,200 lb., and 23,600 lb. continuously. The locomotive will have a maximum speed of 70 m.p.h.

Although no details of the rapid transit equipment have been made known as yet, it is almost certain that multiple-unit motor cars will be used. Third rail probably will be used for supplying the current to the trains.

The standard A.R.A. signal system will be installed in the terminal area. The signals will be controlled from a building near the station, which will house the control relays, the interlocking system and other equipment.

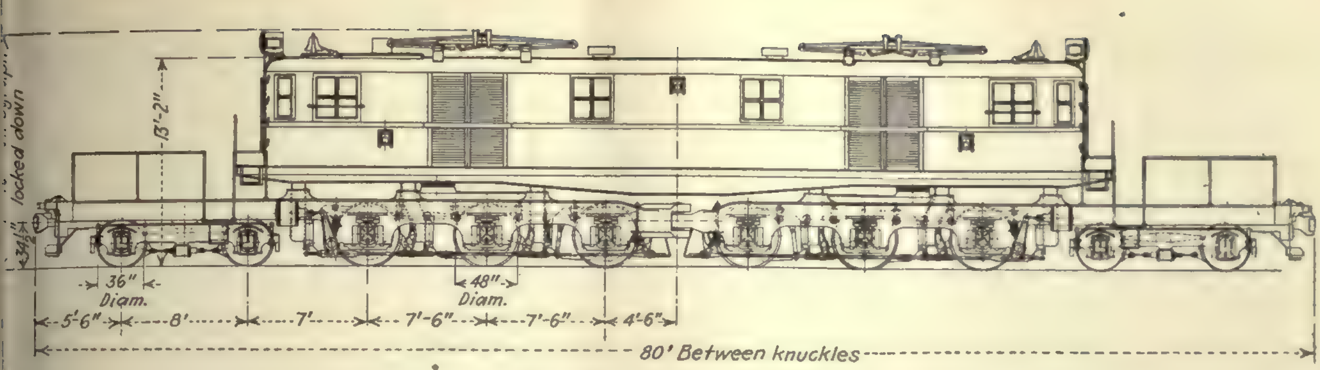
Advantageous Site Selected for Station

Aside from the great advantage of being near the center of the city and adjacent to the business district, the new station site holds other distinct advantages. The principal one is the securing of a station on high ground, approximately at the level of the main business section. This is not only more convenient for steam railroad passengers but almost necessary for rapid transit use. Locating the station on high ground required the building of a long viaduct over the Cuyahoga flats, but this gave a more direct route to the Big Four right-of-way and also provided a bridge over the river high enough to permit passage of all boats. The station area, which comprises 35 acres, is bounded by Public Square, Ontario Street, Superior Avenue, Columbus Road and Canal Road.

The station is so designed that rapid transit passengers and steam railroad passengers are completely segregated. The steam passengers enter the central part of the station, by way of two ramps from the portico of the Terminal Tower Building, while the rapid transit passengers use a concourse on either side of the central section, each concourse being reached by a ramp from a separate lobby in the front of the building. By this arrangement there is no confusion between the two classes of passengers, and each section can be reached from the outside without passing through the other. The two rapid transit concourses are 59 ft. wide and approximately 320 ft. long.

The central section for steam road passengers is 450 ft. long and varies in width from 91 to 175 ft. It is divided into three principal sections: a lobby at the foot of the ramps, 154 ft. wide and 75 ft. long, a ticket lobby, 91 ft. wide and 103 ft. long, and a concourse, 120 ft. wide and 235 ft. long. Adjacent to the concourse is a large waiting room, 163 ft. long and 55½ ft. wide.

On the west side of the main part of the station are the cab stand and baggage room, both having ramps to the street. On the east side are facilities for handling express and mail, with suitable passages and drives to the street. A number of service shops, including a barber shop, lunch room, dining room and parcel room, are located on this side also. The entire station is designed to give a maximum of shop space, so that a large number of stores will be located in the terminal.

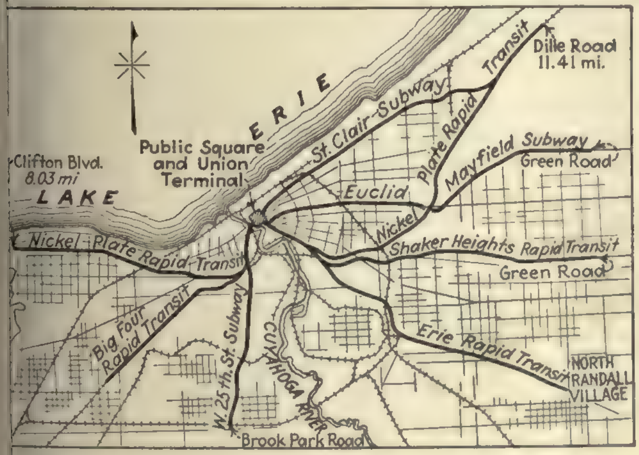


A total of 22 electric locomotives of this type are to be built for the initial operation

The platforms for steam trains are reached by stairays in the center of the main concourse, while those or the rapid transit trains are reached by stairways om the side concourses. The final track layout at the ation will include ten tracks for rapid transit, four of hich will terminate at the station, and 24 for steam ains. However, for the initial layout only six rapid ansit tracks will be laid, and of the 24 steam tracks, nly twelve will be in the station. One of the other acks will be used as a by-pass track, while the others ill be used as a coach yard. As the station is expanded e tracks in the coach yard will be pressed into service. n the rapid transit side only one track will be laid tween adjacent platforms, giving a platform for each ack. On the steam side two tracks will be laid between jacent platforms.

Initially there will be two rapid transit and two ilroad tracks on the east approach and two rapid ansit and two railroad tracks on the west approach. he final layout, however, will have four rapid transit acks and five steam railroad tracks on the east aproach and four rapid transit tracks and four steam ilroad tracks on the west approach.

The district surrounding the terminal is rapidly beoming a busy commercial and business center. The erminal Tower Building, which is constructed over e station proper, is an imposing 52-story structure, ith a total rentable floor space of 560,000 sq.ft. djacent to it is the Cleveland Hotel with its 1,000 oms. An addition to this hotel to give 700 more oms is being planned, and another site is available at e intersection of Superior Avenue and Prospect venue Extension for another building. On the east de of the Terminal Tower Building another large site is available, for which a department store is being planned. The terminal is so designed that two 100-ft. boulevards will pass over the station. One of these, Prospect Avenue Extension, joins Superior Avenue with Prospect Avenue. The other, Huron Road Extension, joins Superior Avenue at West Ninth Street to Huron Road. Three streets, West Second, West Third and West Sixth, will join the two extensions. By this arrangement maximum use can be made of air rights over the terminal.



n extensive rapid transit system was proposed in the Brinckerhoff report to the Cleveland Railway, the lines reaching in several directions from the Public Square and new Union Terminal

Two buildings are nearing completion between the two extensions and a third will be started soon. The two that have been started are the Medical Arts Building of eighteen stories, for those engaged in the medical or allied professions, and the Builders Exchange Building, also an eighteen-story structure. The lower nine floors of this building are a garage with suitable floor sections to the Medical Arts Building which adjoins it. The building to be started soon is the Midland Bank Building, also to be eighteen stories high.

First Train to Use Terminal in January

The work has advanced to a point that it is expected to operate the first train through the terminal in January, 1930. At the present time all retaining walls between Collinwood and East 105th Street are completed, work is well underway on the bridges being built, and the work of widening the right-of-way is progressing rapidly. From East 105th Street to East 40th Street the work on the bridges is being hurried, while the grading is practically all completed The east approach, between East 40th Street and the station, is almost finished. In this section will be three bridges, to span Broadway, Central Avenue and Eagle Avenue.

The west approach also is practically finished. All the steel has been erected on the Cuyahoga viaduct, and the work of laying the concrete deck to support the track ballast is well along. The station proper is largely completed, all the framework having been erected and the actual finishing being well under way. All major contracts have been let, including those for the tracks, the platforms, etc. Prospect Avenue Extension is actually completed, and practically all of the steel for Huron Road extension has been erected. The Terminal Tower Building has been in use for some time, and all excavation has been completed for the department store to adjoin it. The steel has been finished on the Medical Arts Building and the stone is rising. The steel for the Builder's Exchange Building also is almost all in place. By the end of 1929, practically every part of the terminal development, including the electrification system, will be completed.

Industry Fundamentals Discussed by Mid-West Executive

Electric railway executives of properties in Mid-Western and Southwestern states participated in two-day conference at St. Louis, during which the value to the entire industry of these new group conferences under the auspices of the Advisory Council was clearly demonstrated

DURING two days of spirited discussion, executives of properties in the Mid-Western and Southwestern sections of the country, meeting in the second group conference held under the auspices of the Advisory Council at St. Louis, Mo., on April 22 and 23 addressed themselves earnestly to the broad and basic economic, technical, political and operating problems with which the local transportation industry of the country is confronted.

In utmost good humor and in the spirit of interchanging frankly ideas regarding the industry's general situation and outlook, but nevertheless with an apparent determination to dig to the bottom of some of the fundamental questions presented, debate at times waxed warm as those in attendance entered fully into the purposes and spirit of the conference. Practically all of those in attendance participated in the discussion of subjects under consideration, or asked questions of speakers presenting their several points of view. The topics of primary interest which were thus covered spontaneously, with no prepared program or addresses arranged in advance, included competition in local transportation with particular reference to various forms of taxicab operation; rates of fare and the general problem of developing a scientific rate structure for local transportation service; fundamentals of local transportation franchises and the principles which should govern the relations between a local transportation company and the community it serves; relation of transportation to other forms of utility service; taxation, paving charges and other forms of imposts levied upon local transportation companies; and the importance of speed and frequency as elements determining the character of service and its attractiveness to the public; skip stops; express operation and combination services with cars and buses as means of improving service to the community; one-man operation of cars with respect to its effect upon the cost and quality of service; advantages of new cars in attracting patronage and decreasing operating costs.

Chairman Cited Need for Study of Fundamentals

"If nothing more comes out of this meeting than the crystallization of thought upon the need for serious study of many fundamental phases of local transportation economics and the industry's relation to the communities which it serves, the St. Louis conference will go down in the history of the industry as one of the great milestones in its rehabilitation." In these words J. N. Shannahan, chairman of the Advisory Council, who presided, summarized and characterized the breadth and significance of the views presented during the meeting. Those who participated in the discussion included J. P. Barnes, president of the American Electric Railway Association; Chairman Shannahan; Jeff Alexander, Houston; W. W. Holden, San Antonio; R. F. Kelker, Jr., Chicago; M. B. Lambert, New York; F. G. Buffe, Kansas City; G. W. Welsh, East St. Louis; Leo Bozell, Omaha; Samuel Riddle, Louisville; Charles Gordon, New York; R. J. Lockwood, St. Louis;
C. D. Porter, Omaha; P.
Groner, Kansas City; Sta
Clark, St. Louis; Leslie Vick
New York; A. J. Fink, St. Lo
S. W. Greenland, St. Lo
E. B. Meissner, St. Louis; C
Birney, St. Louis.

"Pessimism among ele
railway executives is just
only," said President Barnes,
it leads to closer analysis of
business. The primary concern of the entire indust
he explained, "and the focal point toward which all
cussion of other problems leads, is the disturbing tren
gross receipts of local transportation properties. Tov
overcoming this primary threat to the future as we
the present financial status of the industry, all e
should be concentrated." President Barnes outlined
development of zone-fare taxicab service in Louis
and urged the need for a close study of this deve
ment by electric railway men.

Scientific Rate Structure Needed

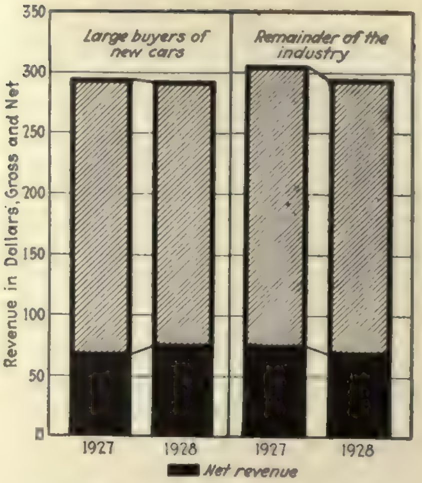
Mr. Alexander discussed the development and
perience with the fare structure in Houston and o
Texas cities, consisting of a 10-cent cash fare, t
tokens for 25 cents, and 5-cent weekly passes sold
a small sum per week to permit wholesale users
transportation service to obtain an attractive rate.
the discussion on this question, Mr. Holden adde
description of the zone system in effect in San Ant
which is superimposed upon a similar fare structur
provide for a special combination of street car and
service designed to appeal to the public desire for sp
transportation service of high quality. Mr. Ho
called attention to the advantages of small units
rendering this character of service.

Need for concentrated study and more general ag
ment upon the fundamental principles of transporta
franchises, and particularly upon the proper divi
between the community and the operating compan
responsibility as to the financial results of opera
was advanced by Mr. Kelker. Ensuing discus
brought out many phases of the relation betw
operating companies and the communities they se
and of the relation between transportation service
the development of cities. A note of caution
sounded regarding the evidence in the industry
tendency to lean toward the idea of subsidy as a s
tion of the industry's economic problems. There
general agreement, however, upon the justification
demanding relief from those forms of special t
which impose a severe burden on transportation op
tion, and from burdensome taxation out of all propor
to that imposed on other industries. It was sugge
that the industry has shown some evidence of
inferiority complex in approaching the admitt
difficult task of obtaining relief from these un
economic burdens. Discussion of one-man opera
brought out several divergent points of view, but a
there seemed to be general agreement that one-
operation, skip stops and all other similar meas
should be adopted with a primary view toward
improvement of service rather than as measures
economy in operation.

New Car Survey

Shows Increased Net

on Many Properties



The combined returns of 41 companies which have been consistent buyers of new cars over a period of years show an increased net for 1928 while the balance of all companies reporting to the A.E.R.A. show a decrease in net.

This is the first of three articles giving results of an industry-wide survey of electric railways which have been outstanding purchasers of new rolling stock during the past seven years. The financial status of 41 properties has been improved materially with the purchase of 5,514 cars, or less than one-third the total operated on them

By

MORRIS BUCK

Engineering Editor

Electric Railway Journal

EVIDENCE continues to accumulate that new cars are not only paying their way, but are of immense benefit to those electric railways that have installed them. To many systems they have been the means of turning a deficit into a surplus and keeping the road in operation. To determine just what has been accomplished and what may be expected a survey has been completed by this paper. Where new cars have been on the properties a sufficient time, results of operation show a definite improvement in comparison with other roads and with the period immediately preceding the introduction of new cars on the same roads.

The survey has been conducted in two ways. An analysis of the returns to the American Electric Railway Association for the years 1927-28 was made to determine if there was any difference in financial results between those roads that are known to have bought a considerable number of new cars in recent years and other properties which have few new cars. A discussion of the figures is given in the present article. Then inquiries were sent to a number of representative roads that have shown marked progress in modernization. From them detailed results have been obtained, giving the comparison of old with new cars wherever it was possible to segregate the records. Some of the replies are included in this article and the results will be analyzed in a future article.

Actual results obtained in both studies indicate that the new cars are a good investment. With reduced industrial employment in many sections, shorter working hours and elimination of much Saturday and Sunday work, there has been a downward trend in riding in some communities. Though this has masked the gain in revenue, the traffic in many cities has been materially greater than it would have been without the new cars to attract passengers.

As to the cost of operation, there is complete agreement that the use of new, light-weight rolling stock reduces expenses. Since the new cars are almost invariably lighter than those they replaced, and the new motors are more efficient, the power costs are reduced correspondingly. Effects on track are less directly apparent, although there is no question that a well-constructed, light-weight car causes less damage to a track than a heavy, old one. When one operator replaces two men there is also a material saving in the cost of transportation.

There also is complete agreement that the effect on public relations obtained by new, modern and attractive rolling stock has been most advantageous. Even though there may not be any immediate gain in changing franchise conditions or making fare adjustments, the new cars give visible evidence that the company is doing its best to provide good service. Practically the only difficulty experienced is that all the districts in a community desire the new cars, and if they are scattered all over the system most of the advantages obtainable with segregation on separate routes are lost.

The analysis made of the companies included in the annual statistics of the American Electric Railway Association for 1928 was based on the purchases of cars over

Comparison of Operating Results, With New and Old Cars

I—Companies Which Made Substantial Purchases of New Cars

	Year 1928	Year 1927	Difference
Railway operating revenue	$282,850,910	$284,169,950	*$1,319,040*
Railway operating expense	208,087,100	211,372,270	*3,285,170*
Net operating revenue	$74,763,810	$72,797,680	$1,966,130
Operating ratio, per cent	73.57	74.38	*0.81*

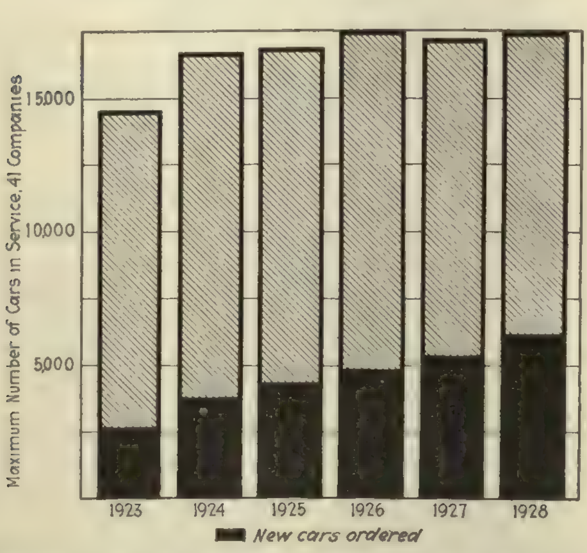
II—Companies Which Have Purchased Few New Cars

	Year 1928	Year 1927	Difference
Railway operating revenue	$294,503,969	$304,869,986	*$10,366,017*
Railway operating expense	225,028,553	231,368,989	*6,340,436*
Net operating revenue	$69,475,416	$73,500,997	*$4,025,581*
Operating ratio, per cent	76.49	75.85	0.64

Italics denote decrease.

a period of seven years, 1922-1928 inclusive. A total of 41 companies whose complete returns were available for five consecutive years, were selected because they were known to have purchased a considerable number of cars within this time. This gave a chance to determine the effect of the cars on operations over an extended period. Of course, a considerable number of the companies thus included have been consistent purchasers of cars for many years, so that even in the earlier years of the survey the operating records are better than for some of the other roads. These 41 companies, however, purchased 5,514 cars from 1922 to 1928, the orders being as indicated in the chart and table. The largest purchases made by this group were in the first three years under consideration, 3,707 having been ordered by the end of 1924.

The total number of active cars on these 41 properties is approximately 17,000. On nearly every property there are additional cars owned which are practically out of commission but are carried on the books. These, however, are not included. It will be noted that this figure varies from year to year, reaching a maximum in 1926. The principal reason for this is that the more progressive companies have written off the oldest cars on the receipt of the new ones, some even going to the extent of celebrating the advent of the new cars with public bonfires in which the obsolete and worn-out cars were entirely destroyed.



Additions of new cars on these 41 properties have totaled 5,641 from 1922 to 1928, as cumulated in black. The total cars in service have changed correspondingly less on account of destruction of the old cars which the new ones replaced

Good Results Shown on 41 Properties

It is significant that while the 41 companies included in the survey as purchasers of new cars kept the revenues in 1928 practically up to the level of 1927, the remaining companies which made returns to the American Electric Railway Association suffered a decrease of more than $10,000,000 in railway operating revenue for the year. The 41 companies were able to reduce operating expenses an amount more than twice the reduction in revenue, while the remaining companies were not able to make up for the loss in revenue by more than $4,000,000. As a result, while the combined operating ratio for the 41 companies fell from 74.38 per cent to 73.57 per cent, a decrease of 0.81 points, the operating ratio of the other companies rose from 75.85 to 76.49 per cent, an increase of 0.64 points. For 1 the operating ratio of the 41 companies was 2.92 cent lower than that for the other companies. Th figures are given in the accompanying table.

The difference in operating ratio, 73.57 per cent the group of modernized properties against 76.49 cent for the others, or 2.92 per cent, is equivalent total value to $8,260,000. This represents the advant for the year 1928 of the better operating conditi While not all of the gain is due to the use of the cars, they are one of the major factors in the differe These companies purchased 5,514 new cars in the y 1922-28, which can be considered as having a m influence on the reduction of operating ratio. At average cost of $12,000 the total investment in th cars was approximately $78,600,000. Hence the sav is equivalent to 10.5 per cent on the cost, without all ing anything for the salvage value of the old cars the accrued depreciation on the old cars which mitted their retirement during the period.

Consistent Purchases of Cars Shown

The companies included in the survey have been sistent purchasers of cars. The record has been car back to 1922. It is seen from the table that up to end of 1928 a total of 5,514 cars in use, or on or out of a total of 17,488 active cars needed to fill out maximum schedules were ordered subsequent to 1 or within the past seven years. This is 31.5 per cen the total. Naturally many of the cars ordered in length of time were not of the type that today can considered modern. In fact, few of them conform the standards that have been set up within the past years as constituting up-to-date equipment. Devel ments that have been made in the past two years not reflected to any extent in these cars. The show made is thus the more remarkable in that the res have been attained with less than one-third of the rol stock modernized even to this limited extent. Whe greater proportion of the rolling stock has been bou in recent years even more striking results can be s This is apparent from a study of individual propert

Individual Properties Make Good Records

Replies to inquiries sent out by this paper to indivi companies have shown that managements are all ent siastic as to the value of new rolling stock. Some the replies are condensed and are included in the foll ing paragraphs. The remainder will appear in fut articles.

NUMBER OF CARS PURCHASED BY THE 41 COMPANIES INCLU IN THE SURVEY, 1922-1928, INCLUSIVE

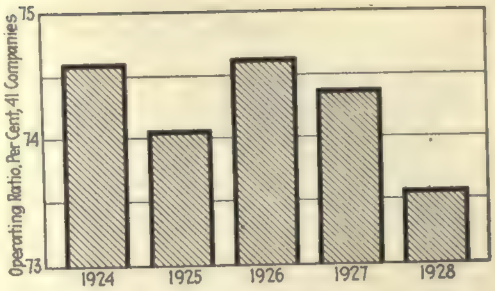
Year	Maximum Number of Cars in Active Service	Number of Cars Ordered During Year	Cumulative of Purchas 1922-192
1922	......	1,364	1,364
1923	......	1,242	2,606
1924	16,611	1,103	3,709
1925	16,856	482	4,191
1926	17,500	537	4,728
1927	17,236	537	5,265
1928	17,488	249	5,514

Georgia Power Company, Atlanta, Ga.—When present management took charge in 1921 it immedia began the purchase of new cars. A total of 243 was bought over a period of seven years. In the s period 218 old cars were retired, so that on Dec. 1927, 46¾ per cent of the cars were less than years old.

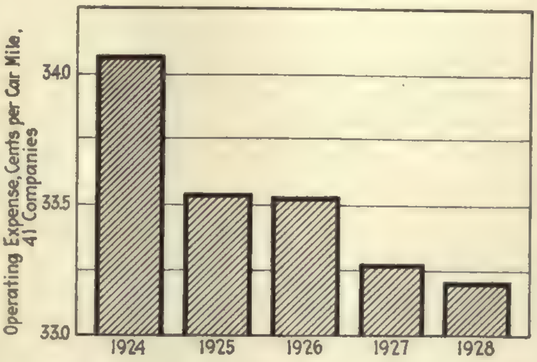
EFFECT OF NEW CARS ON LINE EARNINGS, GEORGIA POWER COMPANY, ATLANTA, GA.

Route	Date New Cars Installed	Earnings of Route: First Six Months New Cars	Earnings of Route: Same Six Months Previous Year	Earnings of Route: Per Cent Increase	Car-Miles on Route: First Six Months New Cars	Car-Miles on Route: Same Six Months Previous Year	Car-Miles on Route: Per Cent Increase	Per Cent Increase System Earnings First Six Month
3	Oct. 1, 1926	$114,536	$101,228	11.61	186,440	168,856	10.40	1.41
5	Mar. 1, 1925	206,772	179,129	10.78	419,865	407,871	2.93	2.63
7	Jan. 1, 1926	87,555	88,160	0.68*d*	211,424	208,699	1.31	1.13
11	Jan. 1, 1926	89,250	83,769	6.14	240,105	260,063	7.68*d*	0.89
12	Jan. 1, 1926	43,798	46,537	5.88*d*	118,526	150,407	21.20*d*	1.19
13	Oct. 1, 1926	33,705	29,705	11.86	71,066	60,573	1.73	1.74
14	Apr. 1, 1926	52,834	51,180	13.47	106,407	105,828	0.55	1.33
15	Dec. 1, 1926	77,899	79,585	2.12*d*	263,911	238,307	10.73	1.52
19	Jan. 1, 1927	32,593	28,000	16.40	169,888	131,477	29.25	1.13
21	Dec. 1, 1925	61,326	50,511	17.66	176,462	170,031	3.76	2.06
22	Jan. 1, 1927	47,424	51,390	7.72*d*	149,585	155,139	3.58*d*	1.51
23	Nov. 1, 1926	87,659	83,803	4.60	309,217	261,988	18.05	1.68
Total and average		$929,357	$872,997	6.45	2,422,896	2,319,239	4.46	....

d Indicates decrease.



Operating ratios have shown a reduction on the properties using large numbers of new cars



Operating expenses per car mile have had a steady trend downward for the past five years where new cars have been employed.

Revenues showed a downward trend from 1922 to 1925, but there has been a sharp upward trend in the return on the investment since then. On twelve lines in Atlanta where obsolete cars have been replaced by new cars there was an average increase in patronage of 6.45 per cent within six months following the installation, with an average increase of 4.46 per cent in car-miles. On two of the lines where service was reduced when new cars were installed, the loss in revenue was very much less than in proportion to the cut in service, and on one line where service was reduced there was an actual gain in riding with the new cars. Headways on all lines have been changed constantly to meet the actual riding requirements. Schedule speed has been increased from 9.21 m.p.h. in 1921 to 9.85 m.p.h. in 1927. Due to the construction of two viaducts in the center of the city the schedule speed dropped in 1928 to 9.7 m.p.h., but when these viaducts are opened this spring the schedule speed will become equal to or higher than it was.

Maintenance of equipment costs for the system have decreased in the past three years, being 2.153 cents per car-mile in 1925, 1.999 in 1926, 1.845 in 1927 and 1.7905 in 1928. This decrease is attributable in large measure to the new cars. At the same time the pull-ins were reduced to 1.39 per day in 1926 compared with 13.2 in 1921.

Without question the use of new cars in Atlanta improved relations with the public and enabled the company to get increases in fares in December, 1927, with practically no opposition.

PURCHASES OF NEW CARS BY YEARS, GEORGIA POWER COMPANY

Year	Total Cars in Service	New Cars Purchased	Cost of New Cars
1923	432	20	$263,840
1924	441	20	261,911
1925	441	60	853,090
1926	425	60	870,000
1927	446	40	590,000
1928	446	..	....

Chicago & Joliet Electric Railway, Joliet, Ill.—This railway, operating an interurban between Chicago and Joliet, placed ten new cars in service in September, 1926. They weigh 39,000 lb. as compared with 62,000 lb. for the old cars, being equipped with four 35-hp. motors as against four 100-hp. motors. The new cars have been able to maintain schedules with increased loads and with more stops per mile.

Before the cars were ordered it was estimated that they would bring in $10,000 additional revenue and cut operating expenses $30,000 a year, a total annual advantage of $40,000 on an investment in the new equipment of $168,000. An increase in wages on Jan.1, 1927, absorbed a considerable part of the saving, leaving $17,327, not including any reduction in the accounts of way and structures. The increase in revenue, however, was $18,966, so that the total gain for the first year the new cars were in service was $36,293. In 1928 there were additional savings in way and structures, power, and equipment, so that while there was a reduction in the gross passenger revenue the net is above that for 1927.

Eastern Massachusetts Street Railway, Boston, Mass.—When this company, which serves a number of cities in the eastern section of the state, as well as running interurban lines between them, was placed under public control about ten years ago, the service had almost broken down and the equipment and track were in deplorable condition. Following the change in control, the company purchased 75 double-truck, light-weight, low-level modern cars. Some of these were fitted for de luxe service, having Spanish leather seats with deep individual cushions, floor covering of linoleum, enclosed piping in the vestibules, and improved trim. Cars of this type proved so satisfactory that the company purchased 50 more in 1926 and remodeled 50 older cars along similar lines.

The purchase of the new cars was predicated on studies that showed annual savings of $1,527 per car per year, based on reduced car maintenance and energy saving only. The method of calculation is shown in the accompanying table.

SAVINGS WITH NEW CARS, EASTERN MASSACHUSETTS STREET RAILWAY

Annual saving in maintenance per car over old equipment	....	$1,072
Annual saving in energy per car	....	455
Total	....	1,527
Interest at 6 per cent on $15,000	$900	
Depreciation at 5 per cent compounded	405	
Amortization of 20 per cent of original value of old car over eight years	150	1,455
Net annual saving for each new car	....	$72

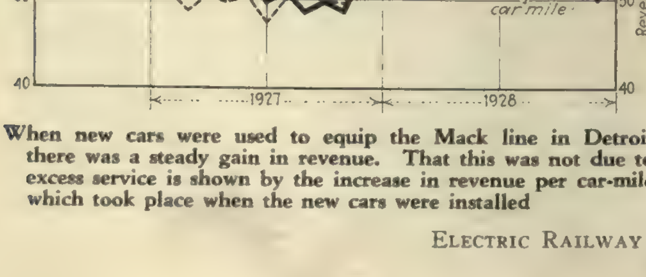
COMBINED OPERATING FIGURES FOR 41 COMPANIES BUYING NEW CARS DURING THE YEARS 1922-1928

	1928	1927	1926	1925	1924
Railway operating revenue	$282,850,910	$284,169,950	$288,222,930	$285,273,910	$285,946,74
Railway operating expense	208,087,100	211,372,270	215,054,250	211,183,820	213,327,20
Net operating revenue	$74,763,810	$72,797,680	$73,168,680	$74,090,090	$72,618,54
Operating ratio, per cent	73.57	74.38	74.62	74.03	74.6
Car-miles operated	626,641,880	535,228,290	641,211,010	629,710,370	625,968,15
Per car-mile:					
Railway operating revenue, cents	45.14	44.75	44.95	45.30	45.6
Railway operating expense, cents	33.20	33.27	33.53	33.54	34.0
Net operating revenue, cents	11.94	11.48	11.42	11.76	11.6

On this basis alone the savings are more than paying for the change, even though sufficient depreciation was not written off previously to retire the old car. No allowance has been made for other important economies, such as reduction in cost of general carhouse labor and material, including brakeshoes, lubrication, armature maintenance, etc., and in the maintenance of track; nor has an allowance been made for reduced costs in the transportation department due to elimination of many pull-ins due to defects. That this policy has been justified is seen from the annual report of the company for 1928. Expenditures for equipment maintenance were smaller than in any previous year. Including expenditures for automotive equipment and also depreciation and retirement it represents 2.92 cents per car-mile, as compared with 3.23 cents per car-mile in 1927. During 1928 the passenger cars operated 38,071 miles per failure, as compared with 1,550 miles per failure in 1920 before the modernization program was begun. Derailments from all causes are now only 17 per cent of the number in 1922.

The effects of the new equipment on revenue are quite difficult to evaluate. The industrial depression in the entire district due to closing of many cotton and woolen mills has caused a reduction in riding. There is evidence, however, that the new cars have been instrumental in preventing further reductions in revenue.

Department of Street Railways, Detroit, Mich.—This system has purchased a number of new cars within the past few years, the most recent order being for 125, placed in 1927. Two lines have been completely equipped with new cars, the Hamilton line, which was changed over in August, 1925, and the Mack line, which was changed over in January, 1927. The results before and after the new cars were put on these lines show that while the earnings did not go up immediately, the revenue per car-mile did increase while the revenue per car-mile on the entire system was going down. In other words it was possible to make the gain in revenue with less increase in service than the average for the city. Furthermore, the lines have held this proportio of the business during the period since the new car were put on. The gain is not due to increasing th service, as the revenue per car-mile has also gone u



When new cars were used to equip the Mack line in Detroit there was a steady gain in revenue. That this was not due to excess service is shown by the increase in revenue per car-mile which took place when the new cars were installed

According to the management, it is rather difficul to evaluate the degree of good will obtained by the ne cars, but many favorable comments have been receive from patrons of the lines on which they have bee placed and numerous requests have been received fro the public expressing a desire to have some of the ne cars serve particular sections of the city.

As to the cost of maintaining cars in Detroit, figure compiled by the Department of Street Railways giv the following comparison:

			Cost of Car Maintenan	
Type of Car	Number of Seats	Average Age, Years	Per Car-Mile, Cents	Per Seat-Mil Cents
Birney	32	7	1.53	0.0478
Peter Witt	52	4½	2.62	0.0504
Double-truck	40	10	3.41	0.0711

In this comparison it should be noted that the Birne cars weigh 16,000 lb., or 500 lb. per seat; the Pete Witt cars 36,500 lb., or 721 lb. per seat; and the misce laneous double-truck cars average 37,800 lb., or 945 l per seat. The lower cost of maintenance may thus l seen to come from two elements, comparative newne and lower weight.

Cincinnati, Hamilton & Dayton Railway, Dayto Ohio.—The annual financial statement of this road f 1927, the first year the new management was in fu control, showed good results despite a general recessi in business activity in the entire Miami Valley and en ployment only 81.5 per cent of 1926. Despite this t passenger revenues of the interurban lines in 1927 we 2.1 per cent more than in 1926, while the total tons freight in 1927 were 26.2 per cent in excess of t tonnage in 1926.

On May 6, 1927, the company introduced ne modern, de luxe, suburban type equipment on its Dayt city lines and increased the frequency of service appro mately 25 per cent. As a result there was a very su stantial and immediate increase of traffic on these lin and a marked reduction in operating expense. Simil cars were introduced between Dayton and Miamisbur The total revenue passengers carried on the Dayt city-Dayton-Miamisburg lines were 14.6 per cent great in 1927 than in the preceding year.

Casual Observations of
Transportation Systems in European Cities,
outlined interestingly—
in the June Number

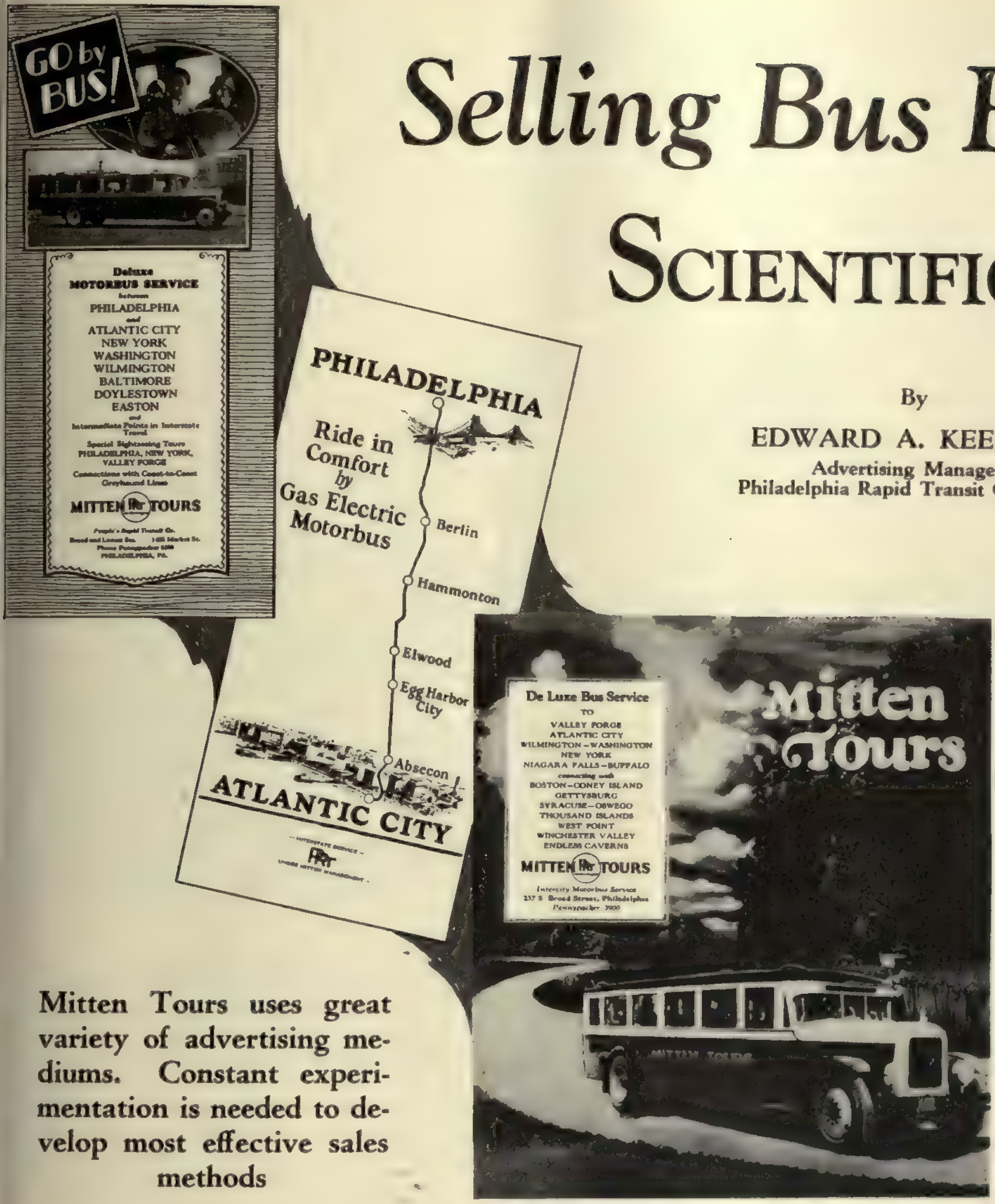
Selling Bus Rides SCIENTIFICALLY

By

EDWARD A. KEENAN

Advertising Manager
Philadelphia Rapid Transit Company

Mitten Tours uses great variety of advertising mediums. Constant experimentation is needed to develop most effective sales methods



"Go by Bus," "Ride in Comfort by Gas-Electric Motor Bus" and similar ride-selling slogans are very effective when carried on attractive folders like these

COMPETITION from other kinds of transportation, particularly the private automobile, is too keen for any bus operator to believe that business will come to him without effort. There is no chance today for the operator who frowns on advertising. Being aware of this need to sell rides, how should the bus operator proceed to organize his selling campaign? Of course, the same basic principles of salesmanship which make a successful clothing, paint or drug business can be applied to the transportation field, but the elaboration of the selling details can only come by experience. The selling of bus rides is a science all its own and only through years of experimenting can it be brought to a high point of efficiency.

Advertising has been linked so inseparably with the history of bus-ride selling that little attention has been paid to any other means of merchandising. However, in the next few years, personal solicitation and the telephone call, guided by a systematic prospect file system, will unquestionably become advertising's greatest allies. Advertising is the life blood of the business in its present state, and since it is not being supplemented to any great extent by personal selling of rides, it must be developed to the highest degree.

Several fundamental questions must first be solved before advertising can begin:

1. What shall be the size of the budget?

2. What mediums shall be used and how shall they be used?

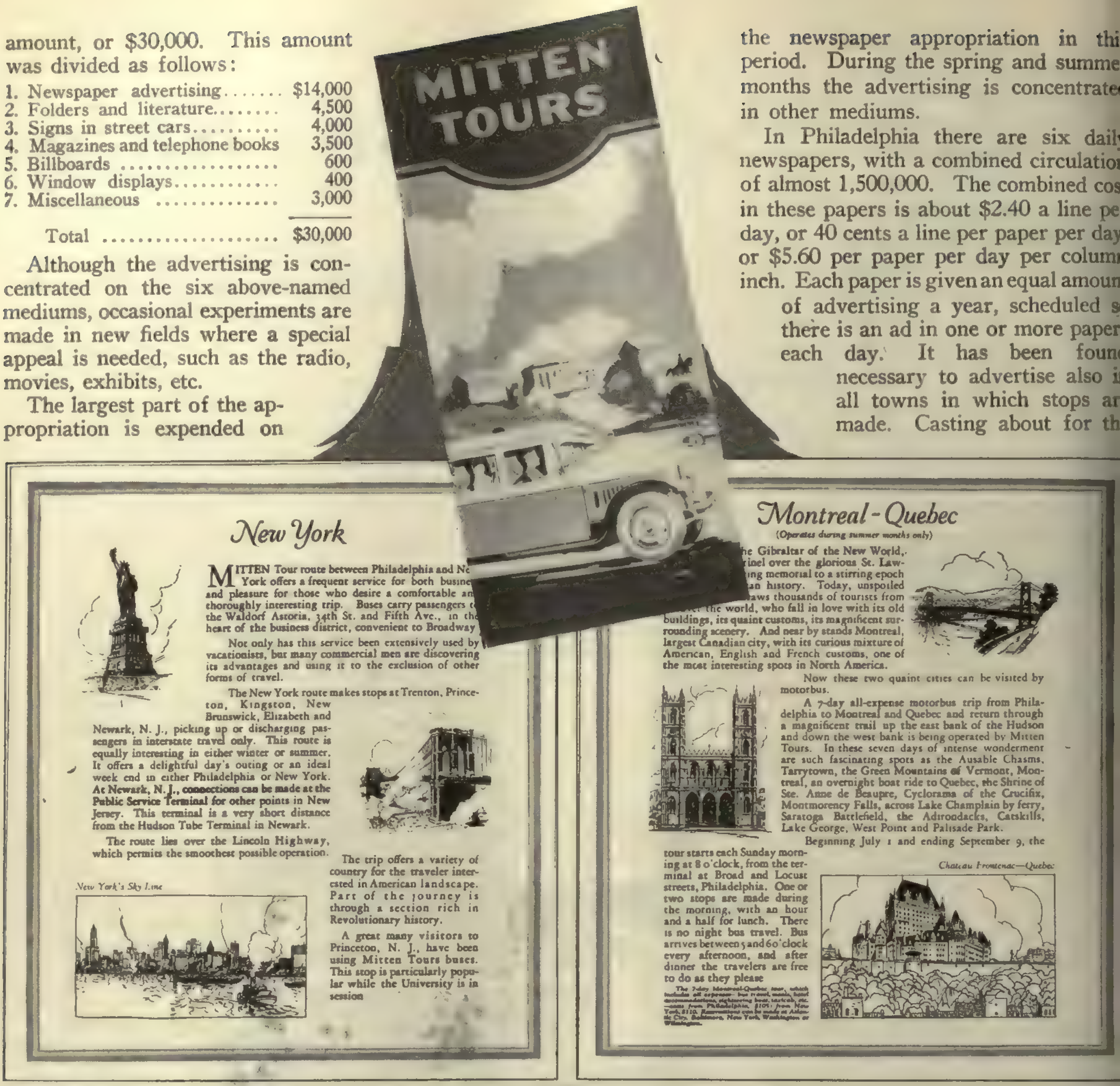
3. How can the results of the mediums used be checked?

The problem of a budget, its size and disposition, is the chief worry of any bus advertiser. Mitten Management has separated its intercity bus business from its city business by the incorporation of two subsidiaries of the Philadelphia Rapid Transit Company, the Philadelphia Rural Transit Company, which has the city lines, and the Peoples Rapid Transit Company, known under the trade name of "Mitten Tours," which handles the interstate travel. Most of the bus advertising efforts are confined to the latter, as this type of business best adapts itself to merchandising. The Mitten Tours advertising budget is based on anticipated gross receipts, a plan which has proved to be entirely satisfactory. The estimated gross for 1928, for example, was $762,000, and the advertising budget called for 3.9 per cent of this amount, or $30,000. This amount was divided as follows:

1. Newspaper advertising	$14,000
2. Folders and literature	4,500
3. Signs in street cars	4,000
4. Magazines and telephone books	3,500
5. Billboards	600
6. Window displays	400
7. Miscellaneous	3,000
Total	$30,000

Although the advertising is concentrated on the six above-named mediums, occasional experiments are made in new fields where a special appeal is needed, such as the radio, movies, exhibits, etc.

The largest part of the appropriation is expended on newspapers. Here no effort is made to tell the story of the joys of riding buses, or of the efficiency of the gas-electric, but rather to furnish a constant reminder and a ready reference for those who desire to go from one place to another. Out of the appropriation of $30,000 for 1928, $14,000 was allowed for newspaper advertising. Of this amount, $550 was set aside for type composition, drawings and engravings. The remaining $13,450 for space was divided into monthly allotments of $1,100 and $1,000, the smaller amount being used in the summer months. Statistics show that the circulation of Philadelphia newspapers increases slightly during the winter months, hence the placing of the greater part of the newspaper appropriation in thi period. During the spring and summe months the advertising is concentrate in other mediums.


MITTEN TOURS

New York

MITTEN Tour route between Philadelphia and Ne York offers a frequent service for both busine and pleasure for those who desire a comfortable an thoroughly interesting trip. Buses carry passengers t the Waldorf Astoria, 34th St. and Fifth Ave., in th heart of the business district, convenient to Broadway

Not only has this service been extensively used by vacationists, but many commercial men are discovering its advantages and using it to the exclusion of other forms of travel.

The New York route makes stops at Trenton, Princeton, Kingston, New Brunswick, Elizabeth and Newark, N. J., picking up or discharging passengers in interstate travel only. This route is equally interesting in either winter or summer. It offers a delightful day's outing or an ideal week end in either Philadelphia or New York. **At Newark, N. J., connections can be made at the Public Service Terminal for other points in New Jersey.** This terminal is a very short distance from the Hudson Tube Terminal in Newark.

The route lies over the Lincoln Highway, which permits the smoothest possible operation.

New York's Sky Line

The trip offers a variety of country for the traveler interested in American landscape. Part of the journey is through a section rich in Revolutionary history.

A great many visitors to Princeton, N. J., have been using Mitten Tours buses. This stop is particularly popular while the University is in session

Montreal-Quebec

(Operates during summer months only)

he Gibraltar of the New World,
inel over the glorious St. Law-
ing memorial to a stirring epoch
an history. Today, unspoiled
aws thousands of tourists from
the world, who fall in love with its old buildings, its quaint customs, its magnificent surrounding scenery. And near by stands Montreal, largest Canadian city, with its curious mixture of American, English and French customs, one of the most interesting spots in North America.

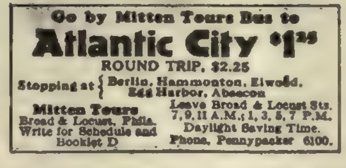
Now these two quaint cities can be visited by motorbus.

A 7-day all-expense motorbus trip from Philadelphia to Montreal and Quebec and return through a magnificent trail up the east bank of the Hudson and down the west bank is being operated by Mitten Tours. In these seven days of intense wonderment are such fascinating spots as the Ausable Chasms, Tarrytown, the Green Mountains of Vermont, Montreal, an overnight boat ride to Quebec, the Shrine of Ste. Anne de Beaupre, Cyclorama of the Crucifix, Montmorency Falls, across Lake Champlain by ferry, Saratoga Battlefield, the Adirondacks, Catskills, Lake George, West Point and Palisade Park.

Beginning July 1 and ending September 9, the tour starts each Sunday morning at 8 o'clock, from the terminal at Broad and Locust streets, Philadelphia. One or two stops are made during the morning, with an hour and a half for lunch. There is no night bus travel. Bus arrives between 5 and 6 o'clock every afternoon, and after dinner the travelers are free to do as they please

Chateau Frontenac—Quebec

High-grade folders are prepared to advertise the special tours. The examples above illustrate the excellent character of the make-up in these folders



Go by Mitten Tours Bus to

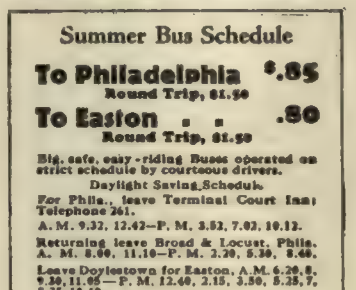
Atlantic City $1.25

ROUND TRIP, $2.25

Stopping at { Berlin, Hammonton, Elwood, Egg Harbor, Absecon

Mitten Tours
Broad & Locust, Phila.
Write for Schedule and
Booklet D

Leave Broad & Locust Sts.
7, 9, 11 A.M.; 1, 3, 5, 7 P.M.
Daylight Saving Time.
Phone, Pennypacker 6100.



Summer Bus Schedule

To Philadelphia $.85

Round Trip, $1.50

To Easton . . .80

Round Trip, $1.50

Big, safe, easy-riding Buses operated on strict schedule by courteous drivers.

Daylight Saving Schedule

For Phila., leave Terminal Court Inn; Telephone 261.

A. M. 9.32, 12.42—P. M. 3.52, 7.02, 10.12.

Returning leave Broad & Locust, Phila. A. M. 8.00, 11.10—P. M. 2.20, 5.30, 8.40.

Leave Doylestown for Easton, A.M. 6.20, 8, 9.30, 11.05—P. M. 12.40, 2.15, 3.50, 5.25, 7, 8.35, 10.10.

Write to Mitten Tours, Broad & Locust, Phila., for Schedule and Booklet A

At the left are samples of newspaper adve tising carried. They give the destinatio the schedule and the fares, serving pri cipally as reminders

In Philadelphia there are six dail newspapers, with a combined circulatio of almost 1,500,000. The combined cos in these papers is about $2.40 a line pe day, or 40 cents a line per paper per day or $5.60 per paper per day per colum inch. Each paper is given an equal amoun of advertising a year, scheduled s there is an ad in one or more paper each day. It has been foun necessary to advertise also i all towns in which stops ar made. Casting about for th very best way to spend the appropriatio in both large cities and small towns, was decided to confine the advertise ments to frequent, small insertions, at tempting to have the ads placed in th motor-bus section, the amusement sec tion or the sport page.

The bus-riding public wants to kno the following facts about the service:

1. Destination.
2. Fares, both one-way and roun trip.
3. Name of the company, its addres and telephone number.
4. The schedule.
5. The fact that the trip is by bus.

Feeling that destination and fares ar of the greatest importance, this matte is set in heavy black type. By carefu aining a space only 1 column wide by 14 lines, 1 in. in height, has been found sufficient for the city apers. In the small-town papers, where the cost per ne is not so high, 52-line ads, 2 columns wide by 2 in. igh, are run. Many of the towns have weekly papers nly. There the ads are inserted every week.

With the opening of new routes, larger copy and onsiderably more art work are used. Good drawings r photographs, where space permits, are very effective. n some of the 52-line ads, therefore, a photograph of a us is inserted. In the smaller ads it is impossible to nclude illustrations, so that extra space is used around he type to avoid the appearance of crowding.

Folders An Effective Medium

The Philadelphia Rapid Transit Company has at its lisposal 40,000 metal boxes or racks for holding folders. These racks are screwed to the backs of all seats in the trolley cars, and are located also in the elevated trains, the buses and on the subway-elevated platforms. In the buses the boxes are fastened to the wall between the seats, directly under the window. The folders also are placed in waiting rooms, in hotels, and on agency counters and racks, and are sent out as direct mail inclosures. The effectiveness of this method of giving out literature was demonstrated last year when 250,000 four-page folders, advertising special tours, were distributed in about 3½ days.

At left — Metal racks on the backs of street car and bus seats are an aid in distributing folders

At right—Clever window displays secure the attention of prospective customers. Here are two typical displays of Mitten Tours

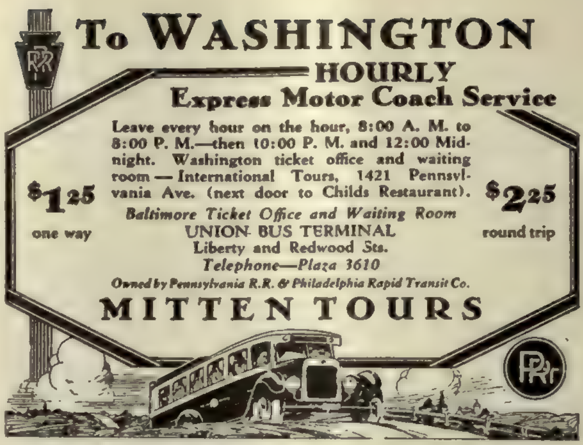
Folders for this distribution are 3⅞x7½ in., have either two or four pages, and are printed in one-color ink. An attractive art head with an interesting title is employed to induce the rider to take the folder from the box. For a folder of more lasting value, the conventional highly-colored tourist folder, so beautifully done today by the steamship companies, is used. Two mistakes which should be avoided are the use of crowded text matter and the use of small photographs. Folders should be laid out with all the skill of a good typographer, using plenty of white space. No typographer will crowd his pages. Drawings are used in the folders instead of photographs, because no scenic photograph is worth while unless it is 8x10 in. in size, or more, and because interesting photographs are difficult to secure. A good artist's sketch of a building or a scene adds a dignity to copy that cannot be obtained by a photograph.

Recently the problem presented itself of publishing a high-grade folder to cover both summer and winter business. It was solved by preparing a basic eight-page folder containing the permanent tours, and printing a four-page insert containing the summer tours and schedules, the inserts being stitched in as many basic copies as needed during the summer months. The chartered bus business is a distinct activity and is treated, therefore, in a separate folder.

Metal frames to hold a card 25½x28 in. are installed on the front of all P.R.T. street cars, on the sides of the buses and on the elevated stations. These signs are an excellent advertising medium for carrying a short message to the public. Visualize 4,000 signs on white cardboard printed in red, blue, green or brown ink, moving up and down the streets of a city all hours of the day and night for an entire week. The signs are of twelve-ply cardboard, printed with waterproof ink. The size of the frame and the distance from which the cards must be read limit the wording. If all the frames on the system are used, the cost of printing and installing these signs is from $300 to $500.

There are two racks within the cars for signs, one in the bulkhead and one hanging from the ceiling. The buses contain a rack in the bulkhead at the front for a card 6½x28 in. About $4,000 a year is spent on these cards with excellent results.

Given a fine location and excellent, well-painted copy, a billboard can be of great value to the bus operator, but to buy a number of boards in an attempt to cover the city, disregarding the all-important factor of location, is an expensive proposition. Outdoor advertising is a good medium to supplement the other mediums like newspapers and folders, but it should not be used for an entire program. The best use for outdoor copy is in converting automobile owners and riders to bus riders. The P.R.T. has a number of small boards, the 4x6-ft. size, along a well-traveled motor bus route for this purpose. Once or twice a year the company uses fifty or sixty 24-sheet paper billboards.



To WASHINGTON

HOURLY

Express Motor Coach Service

Leave every hour on the hour, 8:00 A. M. to 8:00 P. M.—then 10:00 P. M. and 12:00 Midnight. Washington ticket office and waiting room — International Tours, 1421 Pennsylvania Ave. (next door to Childs Restaurant).

$1.25 one way

$2.25 round trip

Baltimore Ticket Office and Waiting Room
UNION BUS TERMINAL
Liberty and Redwood Sts.
Telephone—Plaza 3610

Owned by Pennsylvania R.R. & Philadelphia Rapid Transit Co.

MITTEN TOURS

Newspaper ad, telling of the hourly service between Baltimore and Washington. The ad is given character by the symbols of the two companies

Mitten Tours is a firm believer in the value of window display and its art department spends much of its time in developing attractive signs for the waiting room and ticket agent windows. Wooden frames, finished with a mahogany stain, have been built to hold 25½x28-in. cardboard posters. Attractive show cards can be inserted in these frames and the copy changed at frequent intervals. Local copy is developed for certain ticket agents and when it is completed it is sent to them by bus. The card and frame are sent together, the card being already inserted. The agents keep these signs in their windows for several weeks while new ones are being developed for them. They then send the old ones back by bus in exchange for the new posters and frames. This is an excellent good-will builder among the agents and it is about the cheapest form of publicity that the company has been able to develop.

NOVEL ATTENTION-GETTER CONSTRUCTED

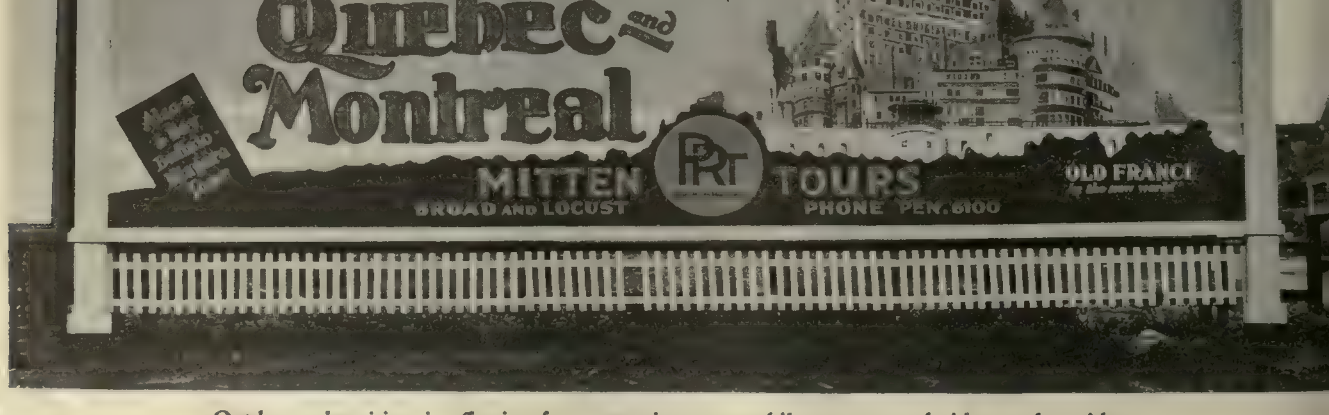
While experimenting with a window card idea, a novel way to make an inexpensive imitation of a stained-glass window was discovered. A 25x25-in. wooden box was built and wired for two electric lights. A cut-all saw then was secured and the design for the window sign laid out on heavy compo board. A pattern was cut in the cardboard with the saw, an colored paper was paste back of the holes. Th finished product gave a star ling effect and proved to a real attention-arrester f passers-by.

ANOTHER GOOD-WILL BUILDER DEVELOPED

Within a circle of 50-mi radius around Philadelph there is a population of mo than 5,000,000. Many these people come to Phila delphia at frequent interva to shop or visit, or to atten some amusement. In effort to reach these potenti customers, the company pul lishes a miniature house organ, *Phillybound,* whic is mailed weekly to a selected list, free of charge. Th aim of this organ is to interest out-of-towners in Phila delphia, by giving them a weekly review of the be show in town, a calendar of theatrical events and movie a series of suggestions on what to visit such as the a galleries, historical shrines, exhibits, picnics, convention parades, sports, etc., and a page of advertising matter f Mitten Management and its subsidiaries, written in ligh vein.

The cost of this pamphlet, which is approximately cents per person per week, is carried jointly by the ele tric railway, the bus companies, the taxicab company an the bank, as all the units profit. Every time a sportin event, a show, or an exhibit is mentioned, full direction are given on how to get there by bus, street car taxicab.

A list of subscribers was developed by sending each prospect with the first issue a small applicatio card with the question: "What means of transportatio do you use in coming to Philadelphia?" and also a blan for questions that they might desire to ask. The mediu has proved a big aid in selling trolley rides, chartere bus service, tours and bank stock, and has brought i



Outdoor advertising is effective for converting automobile owners and riders to bus riders flood of questions to be answered. The medium has een particularly effective in interesting prospective cus- omers in bus tours, and many inquiries regarding trips re stimulated by the copy contained in the *Phillybounds*. Special effort is made in the late spring and summer onths to develop this type of business.

DEPARTMENT FOR DEVELOPING NEW BUSINESS INSTITUTED

Bus merchandising has been developed very rapidly nder the direction of the P.R.T. new business depart- nent. Working in conjunction with the advertising epartment, this department has followed up by personal olicitation, telephone calls and direct mail, the leads ecured by advertising. So far, the greatest effort has een in the chartered bus field, but gradually the organi- ation is spreading to include the intercity service. Men re always available for conventions. Booths are nstalled in the convention headquarters and an informa- on man, with a knowledge of the system and having a upply of all types of the company's literature, is kept n duty at all times.

Part of the work of the new business department to develop a prospect file. An effort is made to obtain e names of people purchasing tickets, as well as those ho make inquiries by mail. Every person taking the iagara Falls tour last year is a prospect for the ontreal-Quebec tour this year, and before the season r tours opens they are solicited.

Contact with the ticket agencies is maintained through e new business department also. One man is kept busy pplying agencies with literature and calling on them at equent intervals to impart enthusiasm, to hear their mplaints and commendations and to watch the effect the advertising in that locality.

MEASURING THE RESULTS OF ADVERTISING IS POSSIBLE

The bus advertising man's problem is becoming in- easingly difficult. No longer can he say "This cam- aign should produce such and such a result, if properly plied." The bus operator is demanding to be shown ore and more just what advertising can do. This is a althy condition and should be encouraged. Adver- sing can be measured and there is no reason why an lvertiser should not know how much money he should end to obtain a certain result.

One method of checking the results is by keying the s, such as "Write for Booklet A," "Write for Booklet ," etc. Although the response does not accurately easure the complete effectiveness of the ad, for many cide to ride and never write in, it does give a relative easurement, which, when compared with other results, ows the selling ability of this particular ad. It is an cellent thing never to announce a new service, a new ice, or a new schedule until it can be advertised. After e first ad appears it is a good idea to check the tele- one calls, personal calls and letters. Several companies e reservation blanks attached to their folders, a plan hich is effective also.

The history of bus advertising runs parallel with auto- bile advertising. In the beginning, the automobile as looked upon as an experiment and somewhat of a y. It required many years to convince the public that e motor car was a necessity. It will be recalled that veral years ago the industry set out to eliminate the rase "pleasure car" and to encourage the use of "pas- nger car" instead. Many bus companies are still back in this first stage of advertising. It is a mistake to give the public the impression that the industry is still an experiment, and advertising now should tend toward establishing the bus as a proven means of travel.

Bus companies must advocate the use of clean, truthful copy, carefully and attractively prepared; they must continue their experiments with every type of advertising medium, collecting data on results and checking these results by keying the advertising; and, finally, they must supplement the advertising with sound, systematic merchandising.

The Readers' Forum

Advantages Cited for Railroad-Owned Power Plants

THE NEW YORK, NEW HAVEN AND HARTFORD
RAILROAD COMPANY

NEW HAVEN, CONN., March 23, 1929.

To the Editor:

I should like to take exception to certain statements appearing in an editorial on electrification of railroads in the March 16 issue of ELECTRIC RAILWAY JOURNAL, in which the statement is made that

"When purchased power is used it is possible . . . to adjust schedules so that train movements, particularly of freight and certain long-distance passenger trains, are made at such times that the additional power does not add in full value to the industrial and lighting peak."

This statement is contrary to the operating requirements of most railroads, which must handle the traffic when and as offered, without regard to the requirements of neighboring power and lighting loads. While certain traffic must be delayed to suit the occupancy of track and terminal facilities by other preferred traffic, most railroad operating officials would not tolerate a further delay because of lack of power to move the business. In fact, a normal surplus of motive power is one of the best arguments used in the solicitation of traffic, and to have such a surplus reduced by electrification would be to prejudice the minds of railway operating officials against electrification.

Indeed, this is one of the strongest reasons in favor of railroad-owned power plants, since, in general, the tendency in making power contracts has been to penalize the consumer for unusual and abnormally high demands, which would be required to handle certain periodic peak business. While it is true that purchased power reduces initial investment and fixed charges of electrification, it is equally true that railroad-owned plants may and, in the few cases where they have been built, do reduce operating expenses by eliminating the penalty of a higher rate caused by the occasional peak business, as well as furnishing the "surplus motive power" equivalent of steam locomotives.

This is a factor which is of great importance in the negotiation of power contracts for electrification; and one which has been largely responsible for the initial investment in railroad-owned power plants, as well as for their continued maintenance in an up-to-date operating condition by their owners, in spite of the growth in the same territory of large power producing companies.

H. F. BROWN,
Assistant Electrical Engineer.

Electric Railway Statistics for 1928

Show Continued Stability

Returns to American Electric Railway Association indicate that both the gross revenues and expenses have been reduced. Combined city and interurban properties make best showing, while city systems hold their own and interurbans suffer a loss. Controlled bus lines make material gains

WHILE little change was experienced by the electric railways in the United States in their operations during 1928 from those in 1927, they made an excellent showing in the face of adverse conditions. This is evident from a study of the returns of the companies made to the American Electric Railway Association and compiled in its statistical department under the leadership of Edmund J. Murphy, chief statistician. In all, 244 electric railways and 160 bus undertakings controlled by them rendered comparative reports for the two years. The railway lines alone showed total operating revenues of $577,354,879 for the past year as compared with $589,039,936 for 1927, a decrease of 1.98 per cent, in a year of unsettled industrial employment. When bus operations are included the revenue is seen to have held up even better. For the entire group of companies and their subsidiary bus lines the total operating revenue was $613,570,305 as compared with $620,626,243 in 1927, or only 1.14 per cent off, indicating that in a number of instances bus extensions and substitutions have been made to serve the railway patrons and hold the revenue.

In the matter of expenses the companies also made a good record. Total operating expenses were $433,115,653 for the rail lines, a decrease of $9,625,606 from the preceding year. Including the bus lines, the expenses were $467,653,613 against $473,860,512 in 1927, a reduction of 1.31 per cent. The operating ratio fell accordingly for the rail lines from 75.16 per cent to 75.02 per cent. Including the bus lines, the operating ratio fell from 76.35 to 76.22 per cent.

The figures cited above, contained in the first two tables in this article, give a comparison of the operations of the railway lines alone with the total rail and bus business conducted by the industry. It will be seen that the bus revenue, amounting to $36,215,426, was $4,629,119 higher than in 1927. This was an increase of 14.66 per cent. Bus operating expenses were $34,537,960, an increase of $3,418,707, or 10.96 per cent. The net operating income of the controlled bus lines accordingly showed an increase from $467,054 in 1927 to $1,677,466 in 1928, an increase of 159.16 per cent. In order to gain this revenue, the bus lines carried 365,465,316 revenue passengers, an increase of 15.61 per cent, and ran 145,944,800 bus-miles, an increase of 12.24 per cent over 1927. Railway-controlled bus lines now cover 6,989.9 miles of road.

Not all of the companies f
nishing returns were able to g
complete figures covering the
tails necessary for thorough a
ysis. Many of them are combi
with electric light, gas or ot
utilities, and the capital struct
is not separated for each bra
of the business. However,
companies furnished informat
from which a study could be m
in detail. The results are gi
in Tables I to X, inclusive.
general they follow the sa
trends as those for the 244 c
panies. Railway operating re
nues were $442,303,214, or 2.07 per cent less than in 19
while operating expenses were $332,622,058, or 2.38
cent less than in 1927. This was reflected in the
which was $109,681,156, or only 1.15 per cent below 19

In Table I the disposition of net operating reve
is shown. There was an increase in net revenue fr
auxiliary operations of $78,255 and in non-operat
income of $1,051,439, along with a reduction in ta
of $766,326. These changes resulted in an increase
gross income from $91,964,266 to $92,582,768. D
dends were increased slightly in the total, altho

COMBINED OPERATIONS OF 244 ELECTRIC RAILWAYS AND CONTROLLED BUS UNDERTAKINGS

Compiled by American Electric Railway Association

	1928	1927 (²)	Increase or Decrease Total	Per
Railway operating revenue..........	$613,570,305	$620,626,243	(d) $7,055,938	(d)
Railway operating expenses..........	467,653,613	473,860,512	(d) 6,206,899	(d)
Net operating revenue.........	$145,916,692	$146,765,731	(d) $849,039	(d)
Operating ratio (per cent...............	76.22	76.35	(d) 0.13	(d)
Miles of track and bus route (¹)......	(²) 32,146.44	(³) 31,228.57	917.87	
Revenue passengers..	(⁴) 7,369,559,334	7,509,508,327	(d) 139,948,993	(d)
Total passengers....	(⁴) 9,796,416,185	9,927,364,292	(d) 130,948,107	(d)
Car and bus-miles...	1,493,068,587	1,419,241,969	1,826,618	

(¹) Miles of road. (²) 154 bus undertakings. (³) 148 bus undertakings. (⁴) 159 bus undertakings.

COMBINED OPERATIONS OF 244 ELECTRIC RAILWAYS

Compiled by American Electric Railway Association

	1928	1927	Increase or Decrease Total	Per
Railway operating revenue	$577,354,879	$589,039,936	(d) $11,685,057	(d)
Railway operating expense	433,115,653	442,741,259	(d) 9,625,606	(d)
Net operating revenue.	$144,239,226	$146,298,677	(d) $2,059,451	(d)
Operating ratio (per cent)	75.02	75.16	(d) 0.14	(d)
Miles of track............	25,159.54	25,187.38	(d) 27.84	(d)
Revenue passengers.......	7,004,094,018	7,193,394,381	(d) 189,300,363	(d)
Total passengers.........	9,358,810,297	9,553,504,164	(d) 194,693,867	(d)
Car-miles (revenue)......	1,347,123,787	1,361,210,095	(d) 14,086,308	(d)

OMBINED OPERATIONS OF 160 BUS UNDERTAKINGS CONTROLLED BY 244 ELECTRIC RAILWAYS

Reporting to American Electric Railway Association

	1928	1927	Increase or Decrease (d) Total	Per Cent
s operating revenue.	$36,215,426	$31,586,307	$4,629,119	14.66
s ope.ating expense.	34,537,960	31,119,253	3,418,707	10.96
et operating revenue	$1,677,466	$467,054	$1,210,412	159.16
erating revenue (per pent)	95.37	98.52	(d) 3.15	(d) 3.19
les of bus route(1)	(2) 6,989.90	(3) 6,041.19	945.71	15.65
venue passengers	(4) 365,465,316	316,113,946	49,351,370	15.61
tal passengers	(4) 437,605,888	373,860,128	63,745,760	16.19
s-miles	145,944,800	130,031,874	15,912,926	12.24

(1) Bus-mileage is miles of road.
2) 154 bus undertakings.
(3) 148 bus undertakings.
(4) 159 bus undertakings.

ly 38 companies paid dividends last year as compared ith 42 companies the year before.

On a car-mile basis the changes from 1927 have been inor. While there was a slight reduction in the num- r of car-miles run, the operating revenue per car-mile as slightly lower, being 44.06 cents against 44.49 nts in 1927.

Operating expenses are analyzed by primary accounts Table II. There was a saving in each of the departents except traffic. The largest saving, $1,985,937, or 5 per cent, occurred in the maintenance of equipment, hile power showed a saving of $1,280,768, or 2.83 r cent. These figures reflect greater attention to these counts and also the increased number of new, lighteight cars in service. The amount spent on track was most as great as in 1927, being 0.65 per cent less in the tal and 0.43 per cent more on a car-mile basis.

That there has been an increase in average fares uring the year is seen by reference to Table IV, in hich derived ratios are presented. The passenger venue per revenue passenger was 7.76 cents in 1928 gainst 7.62 cents in 1927, or 1.84 per cent more. Revue per passenger car-mile and per car operated were most identical in the two years. On account of an increase in the average speed as measured in car-miles per car-hour from 9.44 to 9.54 the revenue per passenger car-hour shows an increase from $4.05 to $4.09. Besides the higher speed in the latter year more service was rendered per car, the annual mileage going up from 37,917 in 1927 to 37,963 in 1928.

CITY-SUBURBAN LINES MAKE BEST SHOWING

Comparative figures on the city, interurban and combined city and interurban lines are given in Tables V-X. It is interesting to note how the companies succeeded in effecting an increase in net income despite the decline in traffic. Reference to Table V shows that the increase was confined to the group of combination lines. While this group suffered the greatest loss in traffic and gross revenue, this loss was more than offset by a reduction in operating expenses. While revenues declined 4.0 per cent the reduction in expense was 5.07 per cent, so that the net operating revenue was slightly higher.

Actually the service given by this group of properties was greater in proportion last year than previously, as the reduction in passenger car-miles, 2.06 per cent, is much less than the reduction in traffic, 5.49 per cent. The greater relative amount of service given was probably due in part to the difficulty of gaging the

TABLE III—OPERATING STATISTICS

	1928	1927	Increase or Decrease (d) Total	Per Cent
Passenger car-miles	969,391,204	982,127,973	(d) 12,736,769	(d) 1.30
Total revenue car-miles	1,003,962,072	1,015,128,401	(d) 11,166,329	(d) 1.10
Revenue passengers(1)	5,209,538,966	5,370,599,141	(d) 161,060,175	(d) 3.00
Transfer passengers(2)	1,357,461,681	1,392,313,863	(d) 34,852,182	(d) 2.50
Total passengers(1)	6,604,126,041	6,796,430,980	(d) 192,304,939	(d) 2.83
Passenger revenue	$412,377,746	$417,703,938	(d) $5,326,192	(d) 1.28
Revenue car-hours(3)	87,872,452	89,684,254	(d) 1,811,802	(d) 2.02
Passenger car-hours(3)	86,757,181	88,455,212	(d) 1,698,031	(d) 1.92
Miles of single track	19,165.05	19,247.99	(d) 82,85	(d) 0.43
Passenger cars operated(4)	23,674	23,949	(d) 275	(d) 1.15

(1) Reported by 181 companies. (2) Reported by 131 companies. (3) Reported by 165 companies. (4) Average maximum number of passenger cars in service daily; reported by 162 companies.

Part I — Combined Operating Reports of 182 Electric Railways for the Calendar Year 1928 Compared with 1927

Compiled by American Electric Railway Association

TABLE I—COMBINED INCOME STATEMENT

	1928	1927	Increase or Decrease (d) Total	Per Cent	Cents per Car-Mile 1928	1927	Increase or Decrease (d Total	Per Cent
ailway operating revenue	$442,303,214	$451,674,670	(d) $9,371,456	(d) 2.07	44.06	44.49	(d) 0.43	(d) 0.97
ailway operating expense	332,622,058	340,715,996	(d) 8,093,938	(d) 2.38	33.13	33.56	(d) 0.43	(d) 1.28
Net operating revenue	$109,681,156	$110,958,674	(d) $1,277,518	(d) 1.15	10.93	10.93	....	.....
et revenue, auxiliary operations	1,606,860	1,528,605	78,255	5.12	0.16	0.15	0.01	6.67
axes	27,688,473	28,454,799	(d) 766,326	(d) 2.69	2.76	2.80	(d) 0.04	(d) 1.43
Operating income	$83,599,543	$84,032,480	(d) $432,937	(d) 0.52	8.33	8.28	0.05	0.60
on-operating income	8,983,225	7,931,786	1,051,439	13.26	0.89	0.78	0.11	14.10
Gross income	$92,582,768	$91,964,266	$618,502	0.67	9.22	9.06	0.16	1.77
eductions from gross income	70,011,747	69,477,433	534,314	0.77	6.97	6.84	0.13	1.90
Net income	$22,571,021	$22,486,833	$84,188	0.37	2.25	2.22	0.03	1.35
ividends	(3) $15,693,680	(4) $15,681,665	12,015	0.08	.....	.....	....	.....
perating ratio (per cent)	75.20	75.43	(d) 0.23	(d) 0.31	.....	.....	....	.....
atio: net income to operating revenue (per cent)	3.55	3.47	0.08	2.31	.....	.....	....	.....

(3) Reported by 38 companies. (4) Reported by 42 companies.

TABLE II—OPERATING EXPENSES BY PRIMARY ACCOUNTS

	1928	1927	Increase or Decrease (d) Total	Per Cent	Cents per Car-Mile 1928	1927	Increase or Decrease (d) Total	Per Cent
ay and structures	$46,582,718	$46,889,062	(d) $306,344	(d) 0.65	4.64	4.62	0.02	0.43
quipment	42,098,442	44,084,379	(d) 1,985,937	(d) 4.50	4.19	4.34	(d) 0.15	(d) 3.46
ower	44,012,941	45,293,709	(d) 1,280,768	(d) 2.83	4.38	4.46	(d) 0.08	(d) 1.79
onducting transportation	144,342,477	148,347,519	(d) 4,005,042	(d) 2.70	14.38	14.61	(d) 0.23	(d) 1.57
raffic	2,011,704	1,899,392	112,312	5.91	0.20	0.19	0.01	5.26
eneral and miscellaneous	51,047,119	51,574,329	(d) 527,210	(d) 1.02	5.09	5.08	0.01	0.20
ransportation for investment-credit	—172,806	—233,190	(d) —60,384	(d) 25.49	—0.02	—0.02	....	.....
Total operating expense	(1) $332,622,058	(2) $340,715,996	(d) $8,093,938	(d) 2.38	(3) 33.13	(4) 33.56	(d) 0.43	(d) 1.28

(1) Includes $2,699,463 undistributed expense.
(2) Includes $2,860,796 undistributed expense.
(3) Includes 0.27 cent undistributed expense.
(4) Includes 0.28 cent undistributed expense.

demands from day to day, but in greater degree was dictated by the conviction that good service is needed to prevent further loss in riding.

The decrease in operating expenses in this city-interurban group was distributed over all the primary accounts except traffic. This is seen in Table VI. The reductions ranged all the way from 1.95 per cent for power to 10.16 per cent for maintenance of equipment. The second largest reduction in expense was 7.24 per cent in maintenance of way and structures. On a car-mile basis, as given in Table X, the relative changes are similar, although the per cent savings per car-mile are slightly less on account of the relatively small reduction in car-miles operated for the year.

When this group of combined city and interurban properties is compared with the city properties and the interurbans the showing is all the more remarkable. The city companies, of course, have the greatest revenue and have shown the least loss in traffic. They were not, however, able to reduce expenses enough to prevent a reduction in net operating revenue. They did save enough to reduce the operating ratio slightly. Operating revenue decreased only 1.34 per cent, al-

TABLE IV—SIGNIFICANT RATIOS DERIVED FROM TABLES

	1928	1927	In or De Per
Railway operating revenue	$442,303,214	$451,674,670	(d
Per mile of single track	23,079	23,461	(d
Gross income	92,582,768	91,964,266	
Per mile of single track	4,831	4,777	
Passenger revenue	412,377,746	417,703,938	(d
Per revenue passenger	(1) 7.76c.	(1) 7.62c.	
Per total passenger	(1) 6.12c.	(1) 6.08c.	
Per mile of single track	$21,517	$21,701	(d
Per passenger car-mile	(2) 42.54c.	(2) 42.53c.	
Per car operated	(3) $15,733	$15,725	
Per passenger car-hour	(4) $4.09	(4) $4.05	
Revenue passengers	(2) 5,209,538,966	(2) 5,370,599,141	(d
Per mile of single track	(2) 281,164	(2) 288,886	(d
Per passenger car-mile	(1) 5.47	5.57	(d
Per car operated	(5) 199,596	(5) 202,968	(d
Per passenger car-hour	(6) 58	(6) 58	
Total passengers	(2) 6,604,126,041	(2) 6,796,430,980	(d
Per mile of single track	(2) 356,432	(2) 365,582	(d
Per passenger car-mile	(1) 6.94	(1 7.01	(d
Ratio: transfer passengers to revenue passengers (per cent)	(7) 28.59	(7) 28.52	
Revenue car-miles	1,003,962,072	1,015,128,401	(d
Per mile of single track	52,385	52,740	(d
Per car operated	(3) 37,963	(3) 37,917	
Per car-hour	(4) 9.54	(4) 9.44	
Car-hours	(7) 87,872,452	(8) 89,684,254	(d
Per car operated	(9) 3,911	(9) 3,952	(d

(1) Reported by 180 companies.
(2) Reported by 181 companies.
(3) Reported by 161 companies.
(4) Reported by 164 companies.
(5) Reported by 160 companies.
(6) Reported by 163 companies.
(7) Reported by 131 companies.
(8) Reported by 165 companies.
(9) Reported by 147 companies.

Part II — Division of Statistics of the 182 Electric Railways into Separate Statements for City, Interurban and Combination City and Interurban Companies

TABLE V—INCOME STATEMENT

	City Lines, 101 Companies		Increase or (d) Decrease, Per Cent	Interurban Lines, 37 Companies		Increase or (d) Decrease, Per Cent	Combination Lines 44 Companies		Incr or (Decr Per C
	1928	1927		1928	1927		1928	1927	
Railway operating revenue	$318,953,403	$323,285,916	(d) 1.34	$21,362,469	$22,147,952	(d) 3.55	$101,987,342	$106,240,802	(d)
Railway operating expenses	234,165,128	237,481,018	(d) 1.40	18,539,999	19,053,338	(d) 2.69	79,916,931	84,181,640	(d)
Net operating revenue	84,788,275	85,804,898	(d) 1.18	2,822,470	3,094,614	(d) 8.79	22,070,411	22,059,162	
Net revenue; auxiliary operations	626,894	728,088	(d) 13.90	153,915	151,431	1.64	826,051	649,086	2
Taxes	20,972,031	21,623,509	(d) 3.01	1,169,525	1,160,193	0.80	5,546,917	5,671,097	(d)
Operating income	64,443,138	64,909,477	(d) 0.71	1,806,860	2,085,852	(d) 13.38	17,349,545	17,037,151	
Non-operating income	1,199,094	5,620,143	10.30	613,145	701,898	(d) 12.64	2,170,986	1,609,745	3
Gross income	70,642,232	70,529,620	0.16	2,420,005	2,787,750	(d) 13.19	19,520,531	18,646,896	
Deductions from gross income	47,454,398	46,643,482	1.74	6,382,448	6,286,391	1.53	16,174,901	16,547,560	(d)
Net income	23,187,834	23,886,138	(d) 2.92	*3,962,443	*3,498,641	....	3,345,630	2,099,336	5
Dividends	(1) 12,778,350	(2) 12,903,692	(d) 0.97	(3) 197,373	(4) 271,795	(d) 27.38	(5) 2,717,957	(6) 2,506,178	
Operating ratio (per cent)	73.42	73.46	(d) 0.05	86.79	86.03	0.88	78.36	79.24	(d)
Ratio; net income to operating revenue (per cent)	7.27	7.39	(d) 1.62	....	....	....	3.28	2.36	3

* Deficit. (1) Reported by 28 companies. (2) Reported by 30 companies. (3) Reported by 3 companies. (4) Reported by 4 companies. (5) Reported companies. (6) Reported by 8 companies.

TABLE VI—OPERATING EXPENSES BY PRIMARY ACCOUNTS

	City Lines, 101 Companies		Increase or (d) Decrease, Per Cent	Interurban Lines, 37 Companies		Increase or (d) Decrease, Per Cent	Combination Lines, 44 Companies		Incre or (Decre Per C
	1928	1927		1928	1927		1928	1927	
Way and structures	$30,132,001	$29,368,627	2.60	$3,166,642	$3,199,146	(d) 1.02	$13,284,075	$14,321,289	(d) 7
Equipment	29,890,865	30,599,681	(d) 2.32	2,204,006	2,349,375	(d) 6.19	10,003,571	11,135,323	(d) 10
Power	29,276,393	30,155,257	(d) 2.91	3,107,511	3,278,019	(d) 5.20	11,629,037	11,860,433	(d) 1
Conducting transportation	107,784,107	110,315,349	(d) 2.29	5,968,893	6,133,966	(d) 2.69	30,589,477	31,898,204	(d) 4
Traffic	789,016	677,206	16.51	324,961	365,139	(d) 11.00	897,727	857,047	4
General and miscellaneous	33,688,663	33,646,326	0.13	3,771,178	3,749,373	0.58	13,587,278	14,178,628	(d) 4
Transportation for investment-credit	—87,205	—140,962	(d) 38.14	—11,368	—22,944	(d) 50.45	—74,232	—69,284	—7
Total operating expense	(1) 234,165,127	(2) 237,481,016	(d) 1.40	(3) 18,539,999	(4) 19,053,338	(d) 2.69	79,916,933	84,181,640	(d) 5

(1) Includes $2,691,287 undistributed expense.
(2) Includes $2,859,532 undistributed expense.
(3) Includes $8,176 undistributed expense.
(4) Includes $1,264 undistributed expense.

TABLE VII—OPERATING STATISTICS

	City Lines, 101 Companies		Increase or (d) Decrease, Per Cent	Interurban Lines, 37 Companies		Increase or (d) Decrease, Per Cent	Combination Lines, 44 Companies		Incre or (c Decre Per C
	1928	1927		1928	1927		1928	1927	
Passenger car-miles	723,195,767	729,281,768	(d) 0.83	35,203,881	37,414,645	(d) 5.91	210,991,556	215,431,560	(d) 2
Total revenue car-miles	724,792,180	730,932,505	(d) 0.84	47,355,280	48,068,369	(d) 1.48	231,814,612	236,127,527	(d) 1
Revenue passengers	4,331,220,007	4,442,139,260	(d) 2.50	57,675,329	60,096,530	(d) 4.03	(1) 820,643,630	(1) 868,361,351	(d) 5
Transfer passengers	(2) 1,205,777,220	(2) 1,231,821,359	(d) 2.11	(3) 1,183,601	(3) 1,257,842	(d) 5.90	(4) 150,500,860	(4) 159,234,662	(d) 5
Total passengers	5,558,794,467	5,691,493,550	(d) 2.33	60,416,859	62,860,239	(d) 3.89	(5) 984,914,715	(5) 1,042,077,191	(d) 5
Passenger revenue	313,120,871	313,577,627	(d) 0.15	13,013,114	13,855,475	(d) 6.08	86,243,761	90,270,836	(d) 4.
Revenue car-hours	(6) 67,341,035	(6) 68,598,984	(d) 1.83	(7) 2,017,900	(7) 2,026,382	(d) 0.42	(8) 18,513,517	(8) 19,058,888	(d) 2.
Passenger car-hours	(9) 67,273,689	(9) 68,505,981	(d) 1.80	(10) 1,252,863	(10) 1,301,778	(d) 3.76	(11) 18,230,629	(11) 18,647,453	(d) 2.
Miles of single track	9,006.87	9,027.05	(d) 0.22	2,876.87	2,898.81	(d) 0.76	7,281.31	7,322.04	(d) 0.
Passenger cars operated (a)	(12) 18,915	(12) 19,043	(d) 0.67	(13) 593	(13) 594	(d) 0.17	(14) 4,166	(14) 4,321	(d) 3.

(a) Average maximum number of cars in service daily.
(1) Reported by 43 companies.
(2) Reported by 81 companies.
(3) Reported by 14 companies.
(4) Reported by 36 companies.
(5) Reported by 43 companies.
(6) Reported by 96 companies.
(7) Reported by 28 companies.
(8) Reported by 41 companies.
(9) Reported by 96 companies.
(10) Reported by 28 companies.
(11) Reported by 41 companies.
(12) Reported by 92 companies.
(13) Reported by 33 companies.
(14) Reported by 37 companies.

TABLE VIII—DERIVED RATIOS

	City Lines, 101 Companies 1928	City Lines, 101 Companies 1927	Increase or (d) Decrease, Per Cent	Interurban Lines, 37 Companies 1928	Interurban Lines, 37 Companies 1927	Increase or (d) Decrease, Per Cent	Combination Lines, 44 Companies 1928	Combination Lines, 44 Companies 1927	Increase or (d) Decrease, Per Cent
lway operating revenue.	$318,953,403	$323,285,916	(d) 1.34	$21,362,469	$22,147,952	(d) 3.55	$101,987,342	$106,240,802	(d) 4.00
Per mile of single track..	35,412	35,813	(d) .12	7,426	7,640	(d) 2.80	14,007	14,510	(d) 3.47
ss income..........	$70,642,232	$70,529,620	0.16	$2,420,005	$2,787,750	(d) 13.19	$19,520,531	$18,646,896	4.69
Per mile of single track..	7,843	7,813	0.38	841	962	(d) 12.58	2,681	2,547	5.26
senger revenue........	$313,120,871	$313,577,627	(d) 0.15	$13,013,114	$13,855,475	(d) 6.08	$86,243,761	$90,270,836	(d) 4.46
Per revenue passenger...	(1) 7.23c.	(1) 7.06c.	2.41	22.56c.	23.05c.	(d) 2.13	(12) 9.52c.	(12) 9.42c.	1.06
Per total passenger	(1) 5.63c.	(1) 5.51c.	2.18	21.54c.	22.04c.	(d) 2.27	(12) 7.93c.	(12) 7.85c.	1.02
Per mile of single track..	$34,765	$34,738	0.08	$4,523	$4,780	(d) 5.38	$11,845	$12,329	(d) 3.93
Per passenger car-mile...	(1) 43.30c.	(1) 43.00c.	0.70	36.96c.	37.03c.	(d) 0.19	40.88c.	41.90c.	(d) 2.43
Per car operated........	(2) $15,279	(2) $15,176	0.68	$20,489	$21,602	(d) 5.15	(13) $17,116	(13) $17,336	(d) 1.27
Per passenger car-hour..	(3) 4.12	(3) 4.04	1.98	(8) 6.23	(8) 6.33	(d) 1.58	(14) 3.85	(14) 3.93	(d) 2.04
enue passengers.......	4,331,22[illegible],007	4,442,139,260	(d) 2.50	57,675,329	60,098,530	(d) 4.03	(12) 820,643,630	(12) 868,361,351	(d) 5.50
Per mile of single track..	480,880	492,092	(d) 2.28	20,048	20,732	(d) 3.30	(12) 123,503	(12) 130,290	(d) 5.21
Per passenger car-mile...	(1) 5.99	(1) 6.09	(d) 1.64	1.64	1.61	1.86	(12) 4.24	(12) 4.40	(d) 3.64
Per car operated........	(2) 207,751	(2) 211,472	(d) 1.76	(7) 90,262	(7) 92,262	2.17	(15) 175,153	(15) 177,546	(d) 1.35
Per passenger car-hour..	(3) 61	(3) 61	......	34	33	3.03	(16) 45	(16) 47	(d) 4.26
al passengers..........	5,558,794,467	5,691,493,550	(d) 2.33	60,416,859	62,860,239	(d) 3.89	(12) 984,914,715	(12) 1,042,077,191	(d) 5.49
Per mile of single track..	617,173	630,493	(d) 2.11	21,001	21,685	(d) 3.15	(12) 148,225	156,354	(d) 5.20
Per passenger car-mile...	(1) 7.69	(1) 7.81	(d) 1.54	1.72	1.68	2.38	(12) 5.09	(12) 5.28	(d) 3.60
io: Transfer passengers revenue passengers per cent).............	(4) 30.6	(4) 30.6	....	(9) 6.05	(9) 6.19	(d) 2.26	(15) 19.08	(15) 19.17	(d) 0.47
enue car-miles........	724,792,180	730,932,505	(d) 0.84	47,355,280	48,068,369	(d) 1.48	231,814,612	236,127,527	(d) 1.83
Per mile of single track..	80,471	80,971	(d) 0.62	16,495	16,582	(d) 0.52	31,837	32,249	(d) 1.28
Per car operated........	(2) 34,904	(2) 34,941	(d) 0.11	(7) 69,139	(7) 69,799	(d) 0.95	(13) 47,414	(13) 46,666	1.60
Per car-hour..........	(3) 9.36	(3) 9.25	1.19	(8) 13.29	(8) 13.40	(d) 0.82	(14) 9.79	(14) 9.70	0.93
-hours (revenue).......	(5) 67,341,035	(5) 68,598,984	(d) 1.83	(10) 2,017,900	(10) 2,026,382	(d) 0.42	(13) 18,513,517	(13) 19,058,888	(d) 2.86
Per car operated........	(6) 3,783	(6) 3,837	(d) 1.41	(11) 4,697	(11) 4,706	(d) 0.19	(17) 4,417	(17) 4,387	0.68

Reported by 100 companies. (5) Reported by 92 companies. (9) Reported by 14 companies. (12) Reported by 43 companies. (15) Reported by 36 companies.
Reported by 91 companies. (6) Reported by 86 companies. (10) Reported by 33 companies. (13) Reported by 37 companies. (16) Reported by 40 companies.
Reported by 95 companies. (7) Reported by 33 companies. (11) Reported by 27 companies. (14) Reported by 41 companies. (17) Reported by 34 companies.
Reported by 81 companies. (8) Reported by 28 companies.

ough traffic was off 2.50 per cent. This was a result d the higher average fare per passenger received during e year. As with the combined properties, the savings ere due to a reduction in service and to savings in st per car-mile.

In this city classification the net revenue from auxary operations fell 13.90 per cent. The total amount of is item was small and the reduction of 3.01 per cent in xes helped reduce the decrease in net, so that the erating income was only 0.72 per cent lower than in 27. While not so large in amount as for the com-nation lines, the city lines increased e non-operating income 10.30 per nt, making the gross income 0.16 r cent higher in 1928 than in 1927. eductions from gross income, how-er, were up 1.74 per cent, so that e net income was 2.92 per cent lower an in the previous year. In amount e net for 1928 was $23,187,834 as ainst $23,886,138 in 1927. Out of ese amounts the dividends paid by companies in 1928 were $12,778,-0, while in 1927 dividends of $12,-3,692 were paid by 30 companies.

INTERURBAN ROADS MAKE POOREST SHOWING

Of the three groups the interurban ads made the poorest showing. Al-ough traffic held up better than on e combined city and interurban operties they did not make compen-ting gains in other items. The pas-nger car-miles were reduced 5.91 r cent while the loss in revenue pas-ngers was 4.03 per cent. Freight r-miles, on the other hand, were in-eased, so that the total revenue car-iles were only 1.48 per cent lower in 28 than in the year before. The erage fare per revenue passenger, like the fares in the other groups, went down from 23.05 cents to 22.56 cents, although the changes in fare during the year were minor.

Operating expenses of these interurbans went down 2.69 per cent while revenues dropped 3.55 per cent, so that the net operating revenue was off 8.79 per cent. Despite the smaller net revenue the taxes were higher, and operating income was 13.38 per cent less last year than in 1927. Non-operating income was down 12.64 per cent and fixed charges increased 1.53 per cent. There was a deficit of $3,962,443 in 1928 compared with one of $3,498,641 in 1927.

TABLE IX—COMBINED STATEMENTS OF ALL T R E TYPES OF COMPANIES ON A CAR-MIL BAS S

	City Lines 101 Companies Cents per Car-Mile 1928	City Lines 101 Companies Cents per Car-Mile 1927	Increase or (d) Decrease, Per Cent	Interurban Lines 37 Companies Cents per Car-Mile 1928	Interurban Lines 37 Companies Cents per Car-Mile 1927	Increase or (d) Decrease, Per Cent	Combination Lines 44 Companies Cents per Car-Mile 1928	Combination Lines 44 Companies Cents per Car-Mile 1927	Increase or (d) Decrease, Per Cent
Railway operating revenue.	44.01	44.23	(d) 0.50	45.11	46.08	(d) 2.11	44.00	44.99	(d) 2.20
Railway operating expenses.	32.31	32.49	(d) 0.55	39.15	39.64	(d) 1.24	34.48	35.65	(d) 3.28
Net operating revenue...	11.70	11.74	(d) 0.34	5.96	6.44	(d) 7.45	9.52	9.34	1.93
Net revenue; Auxiliary operations................	0.09	0.10	(d) 10.00	0.33	0.31	6.45	0.35	0.27	29.63
Taxes..................	2.90	2.96	(d) 2.03	2.47	2.41	2.49	2.39	2.40	(d) 0.42
Operating income........	8.89	8.88	0.11	3.82	4.34	(d) 11.98	7.48	7.21	3.74
Non-operating income......	0.86	0.77	11.69	1.29	1.46	(d) 11.64	0.94	0.68	38.24
Gross income.............	9.75	9.65	1.04	5.11	5.80	(d) 11.90	8.42	7.89	6.72
Deductions from gross income..................	6.55	6.38	2.66	13.48	13.08	3.06	6.98	7.01	(d) 0.43
Net income...........	3.20	3.27	(d) 2.14	*8.37	*7.28	. . . .	1.44	0.88	16.36

* Deficit.

TABLE X—OPERATING EXPENSES ON A CAR-MILE BASIS

	City Lines 101 Companies Cents per Car-Mile 1928	City Lines 101 Companies Cents per Car-Mile 1927	Increase or (d) Decrease, Per Cent	Interurban Lines 37 Companies Cents per Car-Mile 1928	Interurban Lines 37 Companies Cents per Car-Mile 1927	Increase or (d) Decrease, Per Cent	Combination Lines 44 Companies Cents per Car-Mile 1928	Combination Lines 44 Companies Cents per Car-Mile 1927	Increase or (d) Decrease, Per Cent
Way and structures........	4.16	4.02	3.48	6.69	6.66	0.45	5.73	6.07	(d) 5.60
Equipment...............	4.12	4.19	(d) 1.67	4.65	4.89	(d) 4.91	4.32	4.72	(d) 8.47
Power..................	4.04	4.13	(d) 2.18	6.56	6.82	(d) 3.81	5.01	5.02	(d) 0.20
Conducting transportation..	14.87	15.09	(d) 1.46	12.60	12.76	(d) 1.25	13.20	13.51	(d) 2.29
Traffic..................	0.11	0.09	22.22	0.69	0.76	(d) 9.21	0 39	0.36	8.33
General and miscellaneous..	4.65	4.60	1.09	7.96	7.80	2.05	5.86	6.00	(d) 2.33
Transportation for investment-credit............	—0.01	—0.02	(d) 50.00	—0.02	—0.05	(d) 60.00	—0.03	—0.03	......
Total operating expenses.	*32.31	†32.49	(d) 0.55	‡39.15	39.64	(d) 1.24	34.48	35.65	(d) 3.28

* Includes 0.37 cents undistributed expense.
† Includes 0.39 cents undistributed expense.
‡ Includes 0.02 cents undistributed expense

Systematic Maintenanc

Overhauling motors in the shops of the New Orleans Public Service, Inc. The motor is mounted on a four-wheel carriage which supports it at a height convenient for the workmen

Cuts
Costs

**Scientific departmen
organization, caref
training of employe
and engineering super
sion of work have
sulted in improved p
formance of equipm**

SINCE 1922, maintenance of equipment costs and car failures have declined steadily on the railways represented in the Electric Railway Association of Equipment Men, Southern Properties, as told in last month's issue of the Journal. In Atlanta, Birmingham, Memphis and New Orleans, the average annual reduction in maintenance costs from 1922 to 1927 was $350,000, making a total of $2,100,000 for the six-year period. The average annual reduction in car failures was 77½ per cent, the maximum reduction in 1927 being 87½ per cent. The activities of the equipment men's association have been responsible in large measure for this outstanding achievement. The free interchange of cost data and other maintenance figures, the discussion of common problems at the association meetings, and the inspection of properties in the cities where meetings are held have given this group of equipment men an entirely new outlook. A spirit of competition, friendly yet earnest, has been created and has acted as a powerful force for improvement. The specific reasons why maintenance costs on these properties were 49 per cent lower and car failures were 87½ per cent lower in 1927 than in 1921 are worthy of careful study.

First, let us consider org
zation. These mechanical
partments are organized
the underlying thought that
work of each department b
a very definite relation to
work of every other dep
ment, and the whole m
function as a unit with
definite object of securing
highest possible standard
maintenance at the lowest
sible cost. The duties of
department are clearly defined and the relations betw
departments are thoroughly understood by all.
organization of the rolling stock and shops departm
of the New Orleans Public Service, Inc., is shown by
accompanying chart.

It is believed that the scientific control of many of
operations in the shops, such as the dipping and bak
of armatures and the electrical and mechanical tes
of apparatus, can be best secured through enginee
supervision. Another deep-rooted belief is that the
cation of employees is an important factor in crea
a high standard of workmanship. Educational facil
are provided so that not only the workmen but s
foremen and carhouse foremen also may have an op
tunity to learn how to do their jobs better and t
themselves for a better position in the organizat
One property, for example, has mapped out a comp
educational course and has prepared its own instruc
manuals.

To aid further in creating an organization which
function smoothly, these companies believe in peri
meetings of department heads for discussion of the p
lems and co-ordination of the work. Meetings of s

uthern Properties

By G. C. HECKER
Special Engineer
American Electric Railway Association

epartment heads with carhouse foremen, at which oper-ting costs and other maintenance data are discussed, are mployed to keep up an active, friendly rivalry for the eduction of maintenance costs and car failures.

Having developed an efficient organization and havng provided for competent, intelligent supervision of he work to be done, the next step in this improvement rogram appears to have been the development of a sysem of overhauling and inspection based on the old naxim that "an ounce of prevention is worth a pound f cure." In other words, preventive maintenance is he guiding policy upon which the whole system is founded.

They have started out with the theory that a car in first-class condition should, with proper periodical inspection, operate a certain number of miles before requirng any extensive repairs or overhauling. Experience has indicated that on their properties this mileage is, roughly, 50,000. It is then assumed that at the end of that period the car should be completely and thoroughly overhauled, with the expectation that it will successfully operate through another similar period. Supplementing the overhauling, these properties have inaugurated a system of rigid inspection on a 1,000 car-mile basis. Inspections are made at the carhouses; minor repairs only are permitted at these points in the belief that repairs of an extensive nature can best be made by the trained shop forces.

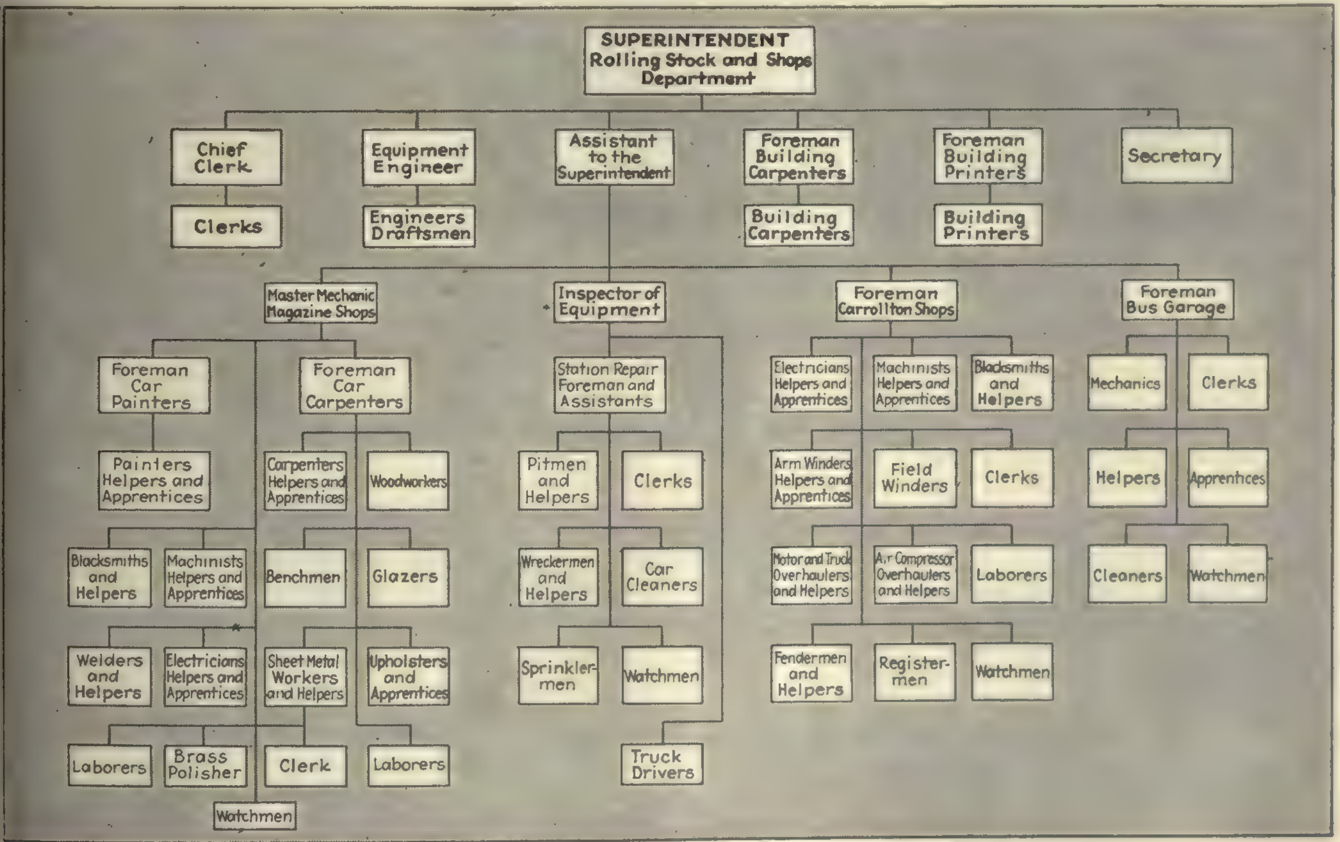
The record of car failures, or pull-ins as they are called, is a convincing illustration of the effectiveness of the overhauling and inspection system adopted. Its effect in reducing the principal causes of car failures is shown in the accompanying table. Monthly and annual figures on these and more than 50 other classified causes of car failures are interchanged by members of the association and serve to keep up an active competition.

The system of overhauling can best be described by following a car through the shop of one of these properties. The New Orleans property has been selected for this purpose. There overhauling is divided into two parts:

1. Car equipment overhauling.
2. Car body overhauling and painting.

Car equipment is overhauled on a 40,000-car-mile basis at the Carrollton shops. Bodies are overhauled at intervals of eighteen to twenty months at the Magazine shops. At the end of a 40,000-mile period, an order issued from the superintendent's office sends the car to the overhauling department. The department foreman is responsible for the quality of the work and a shop engineer is responsible for all of the testing of the overhauled equipment and the final performance of the car. The shop layout and the scheduling of work are such as to permit steady production. This, of course, involves the use of a sufficient number of spare equipment units so that the overhauling and re-equipping of the car may proceed without awaiting the overhauling and testing of any particular piece of equipment.

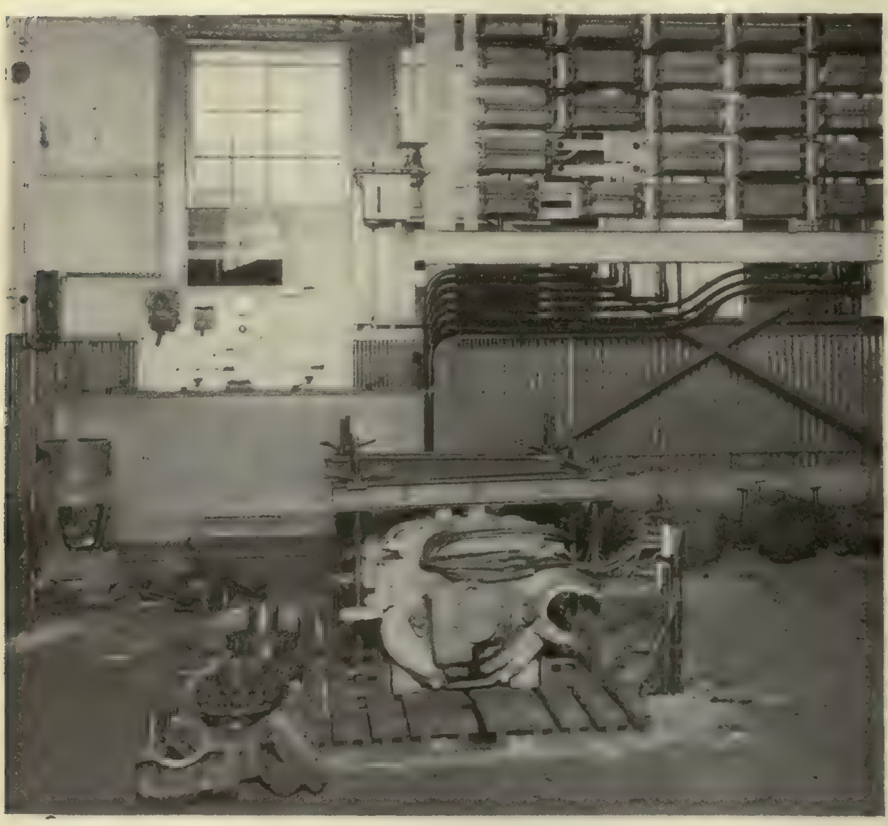
A car hoist raises the car body so that the trucks can be removed. The motors are removed by electrically-operated monorail hoists and transferred to the stripping


SUPERINTENDENT Rolling Stock and Shops Department
Chief Clerk
Clerks
Equipment Engineer
Engineers Draftsmen
Assistant to the Superintendent
Foreman Building Carpenters
Building Carpenters
Foreman Building Printers
Building Printers
Secretary
Master Mechanic Magazine Shops
Foreman Car Painters
Painters Helpers and Apprentices
Foreman Car Carpenters
Carpenters Helpers and Apprentices
Woodworkers
Blacksmiths and Helpers
Machinists Helpers and Apprentices
Benchmen
Glaziers
Welders and Helpers
Electricians Helpers and Apprentices
Sheet Metal Workers and Helpers
Upholsters and Apprentices
Laborers
Brass Polisher
Clerk
Laborers
Watchmen
Inspector of Equipment
Station Repair Foreman and Assistants
Pitmen and Helpers
Clerks
Wreckermen and Helpers
Car Cleaners
Sprinklermen
Watchmen
Truck Drivers
Foreman Carrollton Shops
Electricians Helpers and Apprentices
Machinists Helpers and Apprentices
Blacksmiths and Helpers
Arm Winders Helpers and Apprentices
Field Winders
Clerks
Motor and Truck Overhaulers and Helpers
Air Compressor Overhaulers and Helpers
Laborers
Fendermen and Helpers
Registermen
Watchmen
Foreman Bus Garage
Mechanics
Clerks
Helpers
Apprentices
Cleaners
Watchmen

Organization of rolling stock and shops department of New Orleans Public Service, Inc.

position by a transfer crane. Oil and waste are removed from the bearing and the axle caps and bolts are removed and placed in a cleaning tank. Axle caps, after being cleaned, are checked and those requiring overhauling are sent to the machine shop. A small four-wheel carriage conveys the motor to a position beneath the jib crane where the armature and pinion are removed. The frame head or armature bearing caps are then removed and placed in the cleaning tank. The brush-holders are removed and sent to the electrical department. The armature is conveyed to the armature department.

A jib crane then transfers the motor shell to a storing position where the field coils are given a hammer test, their resistance checked and a 1,750-volt a.c. dielectric test applied for one minute. Coils which do not meet all three of the above tests are sent to the armature department and are replaced with new or repaired and tested coils and a complete polarity check made.



Testing motors before they are returned to service

After this, the motor shell is returned to the assembling position and thoroughly cleaned. This operation consists of placing the shell on a grating in the floor, surrounding it with a canvas-covered frame, and agitating the dirt with compressed air. A suction fan connected to the grating removes the dirt. Field bolts are checked for tightness, weak or broken springs on commutator, or oil-well covers replaced, motor leads and bushings examined and replaced if necessary. Outside leads are treated with a flexible insulating paint and the inside leads, field coils and interior of the shell are sprayed with air-drying varnish.

The overhauled brush-holders are reassembled in the frame, frame heads placed on the shaft of an overhauled armature and the bearings checked. Bearings showing excessive wear are replaced. The commutator-end frame head is then driven and bolted into place, the shell turned pinion-end up, the armature inserted and the pinion-en frame head put in place. The brush-holder alignment i checked, new brushes installed and the brush tensio checked. The motor is then removed to the test floo where the armature bearings are packed with long fibe wool waste.

The motor is then given a fifteen-minute "running-in test, the direction of rotation being reversed several time At this time the armature end play and bearing temperatures are checked. The field coil resistance and the brus tension are rechecked.

Motors equipped with rewound armatures (and abou 10 per cent of all other motors in addition) are given load test, consisting of a 30-minute run, fifteen minute in each direction, at 150 per cent of the one-hour ratin

Next, the pinion, previously heate in boiling water, is driven in plac and the armature shaft washer an nut drawn up tightly against th pinion. Limit-of-wear gages ar used to determine the discardin point of both pinions and gears an every effort is made to keep gear and pinions matched. The axl caps are loosely bolted to the moto shell, the motor is sprayed wit truck paint and returned to th truck overhauling position.

In the meantime, practically all o the other electrical, mechanical an pneumatic equipment has been removed from the car, sent to th proper department, thoroughly overhauled and tested and returned fo assembling. Also, the trucks hav been most thoroughly overhauled an the work of reassembling the equipment begins. Before the trucks ar placed under the car, the motor control, air compressor and buzze wiring are given a 1,500-volt a. test for one minute. After the bod has been placed on the trucks an the motors connected, a series o tests is applied to insure that a connections have been properl made.

To illustrate the thoroughness with which armature are overhauled, let us follow an armature through tha department. Armature overhaul is classified either a "dipped and baked" or "rewound," according to the wor done on them. An armature of the first class is give a bar-to-bar test and also a 1,500-volt a.c. test for on minute. All bands and dressings are removed, the commutator string band is painted, fillers are placed on lo coils and the core bands replaced. The armature is the cleaned and preheated for four hours, after which i insulation resistance is measured. Next it is dipped an placed in the baking oven for at least 30 hours. Th actual removal from the oven is determined by the insulation resistance which must be at least 0.6 megohn The armature is redressed and the end bands replaced the commutator is calipered and a light cut taken, afte which it is slotted if necessary. A second bar-to-bar te and a high-potential test are then applied, the commutato is covered with cardboard, the bearings fitted to th shaft and the armature returned to the motor departmen

Armatures which require rewind-ig go through substantially the same ocedure after being rewound. rmatures of this class, after being ripped of old coils, are checked for ose or bent laminations and for nt or sprung shafts.

Short-circuited field coils of mod-n motors are replaced with new ones the number to be repaired is so hall that impregnating equipment nnot be justified. Field coils of the der motors are stripped, given a pping and baking treatment, and oroughly tested to insure their fit-ss for service.

Employee education has played an important part in improving maintenance practices

Overhauling and testing of each piece of equipment are orough. The quality of the work is clearly reflected the steady decreases in the number of pull-ins due to uipment failures. Supplementing the thorough over-uling methods, of course, is a carefully worked-out stem of inspection at each of the five carhouses, on a 000-car-mile basis. These inspections cover everything om the trolley wheel to the brake shoe. Careless in-ection simply is not tolerated. If a car fails between spection periods the records disclose the identity of the spector and he is cautioned by the foreman. A second fence takes him to the superintendent of equipment for stronger admonition and, on a third offense, he is in-ted to find work elsewhere.

ANALYSIS OF IMPORTANT CAUSES OF CAR FAILURES

Company	Car Failures Caused by	No. of Failures Annually from Each Cause 1921	1922	1923	1924	1925	1926	1927	1928
lanta	Armatures	.....	320	270	177	147	63	41	13
	Motor leads	271	177	80	32	13	12	9	4
	Hot journals	331	187	82	30	24	7	3	0
	Hot armature bearings	45	40	25	21	8	3	5	1
	Controllers	292	191	156	155	79	21	30	10
	Brakes	397	194	121	69	50	26	26	7
w Orleans	Armatures	1,505	400	56*	35	20	13	11	7
	Fields, leads and cables	1,168	315	43*	12	12	12	4	0
	Gears and pinions	72	20	7*	11	5	1	1	0
	Controllers	280	54	13*	12	7	3	2	2
	Air and hand brakes	1,056	203	57*	27	8	2	1	1
	Circuit breakers	44	20	5*	1	0	1	2	0
rmingham.	Hot journals	245	114	31	16	31	14	20	10
	Air brakes	230	141	74	66	30	17	12	8
	Brake rigging	262	119	67	70	29	32	36	16
	Armatures	277	325	202	172	167	171	141	80
	Fields	211	224	192	130	141	117	119	40
emphis	Armatures	.....	93	...	...	...	...	...	39
	Hot armature bearings	.....	25	...	...	...	...	...	8
	Controllers	.....	23	...	...	...	...	...	7
	Trolleys	.....	16	...	...	...	...	...	2
	Hot journals	.....	19	...	...	...	...	...	0

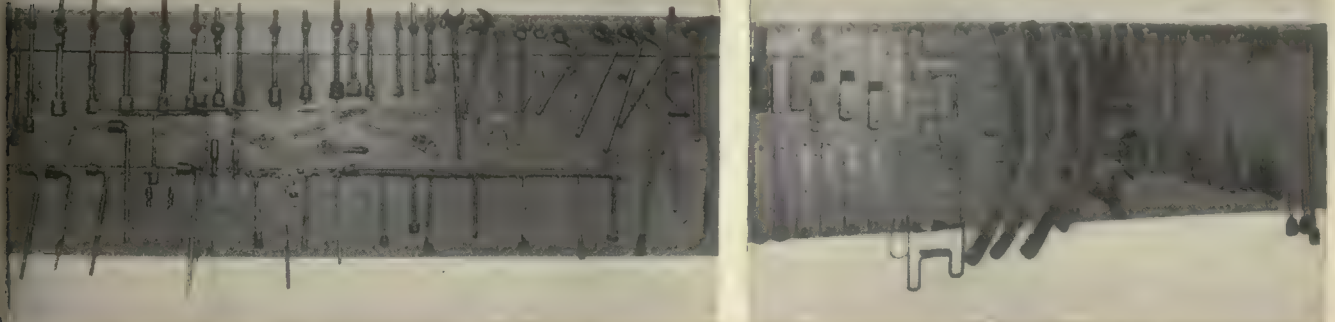
*Figures for 1923 cover only first nine months.

Only light repairs are made in a carhouse. Apparatus quiring major repairs is replaced with tested units. To illustrate, burned contact tips of line breakers may be renewed but if any other repairs are found necessary the unit is replaced by one from stock and is sent to the overhauling department where the necessary repairs are made and the unit tested, after which it is returned to stock. Each carhouse carries in stock a small supply of replacement units, including such items as a line breaker, circuit breaker, lightning arrester, resistor, motorman's brake valve, air compressor, compressor governor, truck brake rigging, wheel and axle and axle assembly.

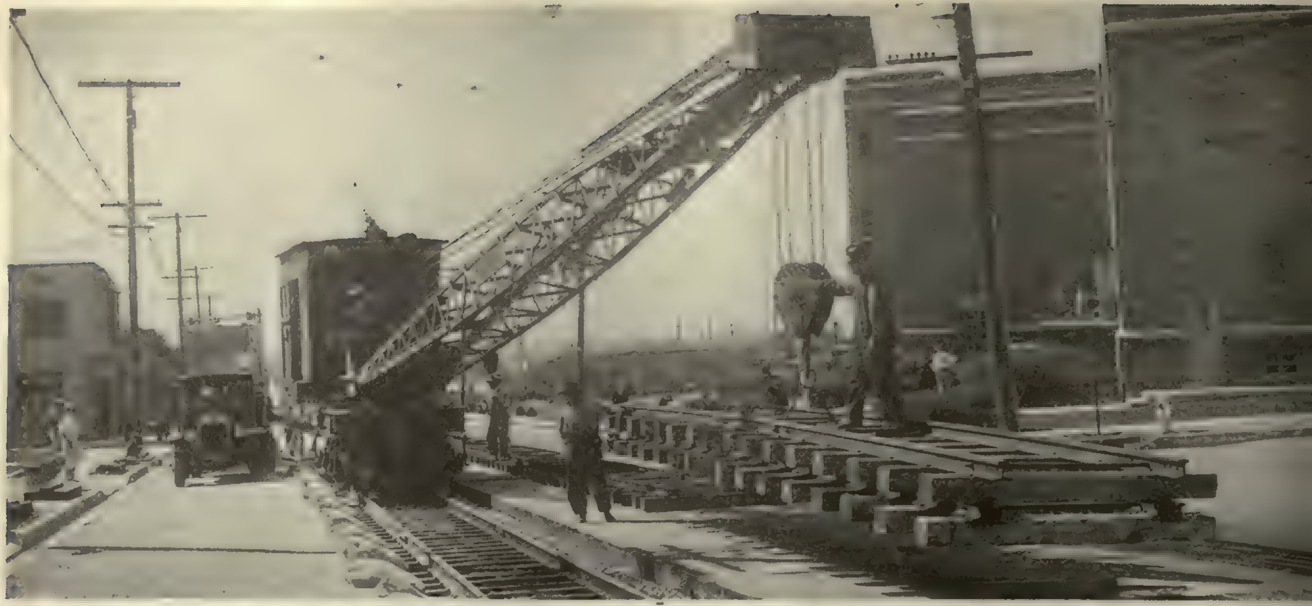
In addition to the inspection and incidental repair or replacement of units, the oiling, cleaning and washing of cars are done in the carhouses. Other work done at these points is the grinding of wheels and the changing of wheels and axles, as this can be done in a fraction of the time necessary to send a car to the shop. It has the further advantage that the car need not be held out of service for such work, only between peak hours. The carhouses also maintain and operate sanding, sprinkling and emergency wrecker service.

A complete supply of hand tools and brake rigging maintenance parts is kept on a centrally located board at each carhouse. This method of storing tools and maintenance parts not only improves appearances but reduces lost motion to a minimum and serves as a check on tools, since a foreman coming on the job will not accept the board unless it is completely filled or missing tools are accounted for. In connection with the inspection and repairs at carhouses, a complete record is kept which gives the superintendent of equipment a most effective check on all work done and on equipment failures.

Although the overhaul and inspection systems on the four properties are not identical in all respects, the conception of the job to be done is the same. The practices outlined are considered typical of the type of organization and maintenance methods in use in the four mechanical departments.



A complete supply of hand tools and brake rigging parts is kept on a centrally located board at each carhouse

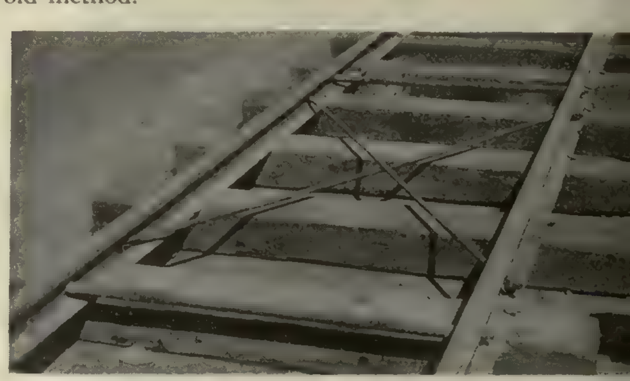


Portable track in 33-ft. sections is placed, removed and carried from one location to another by means of a crane car

Portable Emergency Track Used in Los Angeles

TRACK reconstruction work by the Los Angeles Railway has been facilitated by the use of portable emergency track. This is made up in 33-ft. lengths using 70-lb. rails and ties securely fastened with spikes and $\frac{5}{8}$-in. lagscrews. The lagscrews are driven through holes drilled in the inside flange of the rail, while spikes are used on the outside flange. Tierods are run through pipes which are cut the width of the gage to prevent the rails from spreading. In the center of each section are skew bracings to prevent the rails from creeping.

These sections can be conveniently carried on flat cars to the site of the work. They can also be picked up by the crane and carried, two sections at a time, from one location to another, as necessity demands. More than 900 ft. of track can be laid in half an hour. It is estimated by the engineering department of the railway th there is a saving of $1 per foot of single track over t old method.

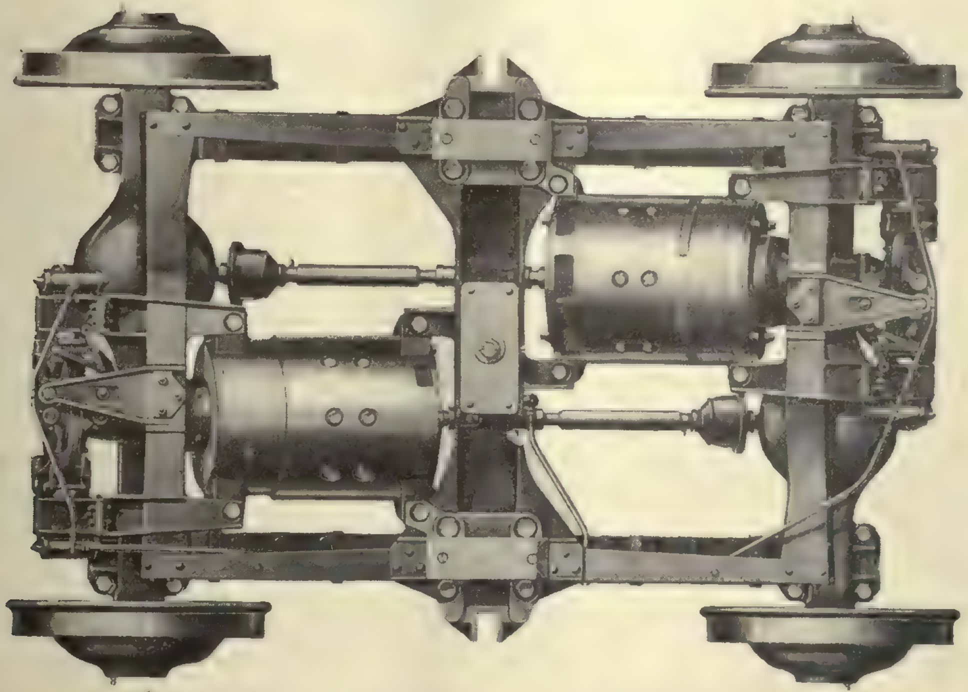


Rails are spiked on the outside to wood ties. The tierods r through pipe spreaders. Diagonal cross bracing is used give rigidity to the section

For transportation to some distant points, the sections of portable track are carried on a flat car

New Timken Truck

Equipped With Armature Shaft Brake



New Timken worm-drive truck which has a disk brake mounted on an extension of the armature shaft at the commutator end of each motor

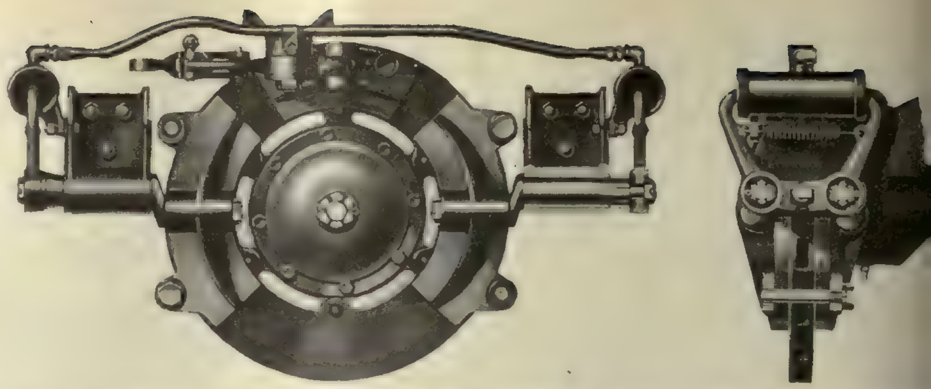
Disk brake on commutator end of each motor is actuated by two small-diameter air cylinders. Wheel design simplified. Unsprung weight of new worm-drive model has been reduced to 2,445 lb.; total weight is 6,030 lb.

SUBSTANTIAL reduction in unsprung weight has been accomplished in a new type of worm-drive truck, designed by the Timken Detroit Axle Company, by placing the brake mechanism on the armature shaft of each motor instead of the wheels or axles as has been customary heretofore. The new truck, known as model 52, is similar in many respects to the model 51 truck exhibited last fall at the A.E.R.A. convention at Cleveland. The disk brakes, however, are an innovation for which many advantages are claimed. Besides the reduction in unsprung weight, the simplification of wheel design is considered to be an important improvement.

The armature shaft brake is mounted on the commutator end of the motor. An extended armature shaft and housing containing a bearing to support the shaft are carried over the axle, placing the brake out in the clear. This brake consists of a 16-in. self-ventilating disk with two pairs of shoes on each side operated by air. The four shoes have a total area of 123.27 sq.in., which is slightly greater than the total lining area of two wheel brakes of the type previously used. Brake material is moulded directly to the shoes and, for this reason, the total thickness of brake lining is usable.

The armature shaft is in one piece and the extended portion is supported on a roller bearing in the end of the special housing which is incorporated in the motor end cover. The disk and hub are designed to be mounted on the armature shaft so that the center line of the disk comes over the center line of the outboard bearing. The shoes are carried on cranks having 1 in. throw and mounted in brackets, each of which is attached to the frame end cross-member by three bolts. Adjustment to center the shoes in relation to the disk is made at the factory by shimming between this bracket and the truck frame end cross-member. Braking reaction is taken up by this cross-member.

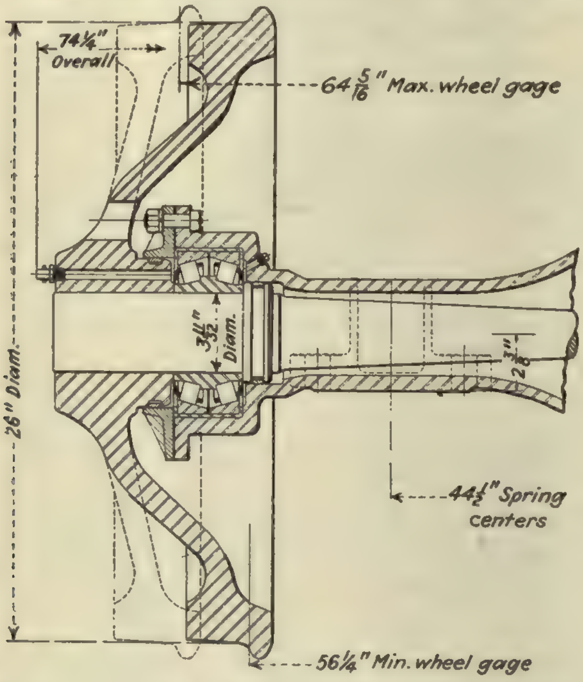
Each pair of brake shoes is actuated by a small diameter air cylinder through a lever and crank arrangement, which gives sufficient braking effort when using 50 lb. of air pressure to slip 26-in. wheels with normal passenger load. As the bottom of the disk is a considerable distance



The brake disk is acted upon by two pairs of brakeshoes, each pair being operated by a crank connected to a small-diameter air cylinder

above the top of the rail, it is not subject to wheel wash as are wheel brakes. The centrifugal action of the disk will tend to prevent any oil, water, dirt, etc., remaining on the disk in sufficient quantities to affect braking. No adjustment for wear is necessary until at least one-half the brake material has been worn away. When adjustment is necessary it is made by loosening the nuts holding the serrated levers in place against the serrated collars and rotating the levers to compensate for wear and then locking them in place. It is thought that only one adjustment should be necessary in the life of the linings, which should be 20,000 car-miles or more.

Because of the position of the brake in the clear beyond the axles, replacement becomes very simple. The whole brake and mechanism are entirely accessible from a pit and there is no necessity for disturbing any part of the car body, trucks, axles, or motors to replace the shoes or any other part of the brake. To replace shoes, the shoe crank and bracket assembly on each side can be disassembled by removing three bolts. Shoes can th be removed by taking the nut off the crank.



Elimination of wheel brakes has greatly simplified wheel design. By changing the offset, the truck can be adjusted to any desired track gage

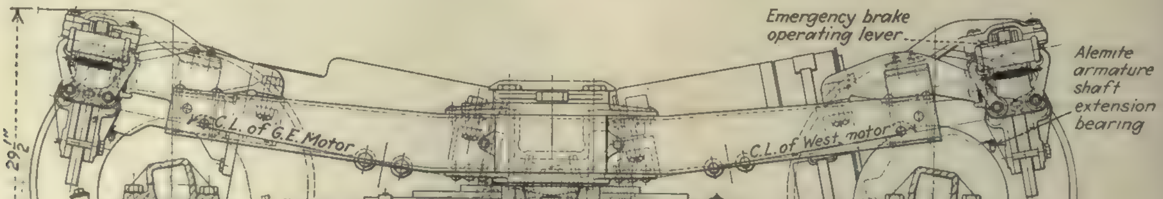
Due to the low coefficient of sliding friction betwe tire and rail, the braking stresses set up in the vario members are no greater than the driving stresses. If t operator should make an air application before cutti out his controller, the stresses set up by locking t wheels with wheel brakes are considerably greater th if the wheels are locked with the armature shaft brak as under the latter condition the armature is slowed dow and locked with the wheels. There are no addition loads put on the armature bearings as an additional bea ing has been added in the extended housing to take ca of the static and torsional loading imposed by the brak

Mounted at the top of the armature shaft disk is additional pair of shoes operated by hand. The tot area of lining on these shoes is 41.08 sq.in. per pair. Tl shoes are mounted on levers which are carried by supporting bracket attached to the frame and cros member. This bracket is adjustable so as to center sho in relation to the disk. They are actuated by pulling a link which operates the two levers carrying the shoe

The new model truck without motors has a weight only 4,160 lb. Each truck is designed for two 50-h high-speed motors which will add approximately 1,870 to the weight. The total weight is 6,030 lb., of whi 2,445 lb. is unsprung.

The maximum weight which can be carried on the tw trucks of a double-truck car is 60,000 lb. Wheel ga can be adjusted from a minimum of 4 ft. 8½ in. to maximum of 5 ft. 4½ in. by varying the wheel offs

It is expected that these new model 52 trucks will in production early in May. Already orders have be received from the St. Louis Public Service Compan Chicago Surface Lines, Louisville Railway, Departme of Street Railways, Detroit, Cleveland Railway, Pitt burgh Railways, and Boston Elevated Railway.



Under normal load the over-all height of the new truck is 29½ in. from the top of the rail. The minimum clearance is 3⅞ in. under the rear axle housing

TIE REQUIREMENTS

# of Electric Railways

By

HOWARD H. GEORGE
Superintendent of Way
Cleveland Railway

U. S. electric railways have in use approximately 101,000,000 wood ties, and buy 4,700,000 ties per year, of which only 1,170,000 are treated. These facts were brought out by Mr. George in an address before the National Association of Railroad Tie Producers

THERE are in the United States and Canada at the present time approximately 3,400 miles of electric railway acks, exclusive of electrified eam railroads. The total for anada is approximately 2,500 iles, leaving about 40,500 miles the United States, in which acks there are probably not ore than 101,200,000 ties of all nds. There is no absolute rec-d of the number of these ties at are substitutes for wood, or ow many of the wood ties are eated. In 1922 one of the special committees of the merican Electric Railway Engineering Association deavored to secure information relative to the extent the use of substitute ties and sent out an inquiry to of the principal street railway properties known to users of this type of tie, with a total mileage of 17,156, about 42 per cent of the total in the country. Replies ere received from only 24 companies, whose total ileage was 8,477, or only 21 per cent of the total mile-e in the country. These companies reported having in rvice a total of 219,415 substitute ties. The weighted erage spacing of these ties was found to be 4.3 ft., that the ties reported in this investigation represented little less than 180 miles of track.

The data referred to were so limited in their extent that was unwilling to use them as the basis for my analysis the situation as it exists at the present time. I accord-gly sent out to a selected list of electric railways roughout the entire United States, which included every rge property and many of the smaller ones, a special tter, requesting this information for their properties. he list included about 165 companies and covered prac-ally every state in the Union. Replies were received om 156 companies with a total of 27,572 miles of single ack. This is more than 67 per cent of the total electric ilway mileage in the country and may, therefore, be nsidered as forming a fairly accurate cross-section of esent practice in regard to the use of substitute ties the electric railway companies. The above companies reported a total of 1,717 miles of track constructed with substitute ties, or a little less than 6¼ per cent of the total mileage reporting.* Out of the 156 companies reporting, 42, or more than 26 per cent, reported no substitute ties; and, from my personal general knowledge of the properties not covered by the inquiry, I feel that it is quite safe to state that, had the data been secured from them, the percentage figure just given for track built with substitute ties would be decreased.

Assuming that the percentage would not change materially if data for all trackage were included, this would mean that there are approximately 2,547 miles of electric railway track in the United States constructed with substitute ties. This would leave about 38,353 miles of track built with wood ties and would represent a total of approximately 101,000,000 wood ties. The latest information which I have had an opportunity to study indicates that the electric railways are purchasing about 4,700,000 wood ties per year, of which about 1,170,000 are treated. This latter figure would undoubtedly be increased somewhat if records were available to show the number of ties that were given some form of treatment by the electric railways themselves. The figures indicate that the average life of wood ties in electric railway tracks is slightly less than 21 years. The use of creosoted wood ties by the electric railways has not yet approached anywhere near that by the steam railroads.

The use of treated ties by the electric railways is on the increase and is bound to go forward more rapidly as their financial condition improves. While there is still much to be desired in this respect, it is probably safe to say that the prospects look better today than they have at any time since the war. As an economical proposition, the treatment of timber of any kind should not be figured in terms of first cost only. The thing that counts is the average cost per year of useful life. This is where the wood preserving business has failed to take fullest advantage of the possibilities of promotion in a field which offers great possibilities in the line of an increased market for its product.

This includes the track in New York City and Washington, C., with underground conduit system.

It is well known that, in open track, the best untreated white oak tie obtainable today cannot be expected to give much more than ten years of satisfactory service, and other types of untreated timber proportionately less; and, furthermore, even when obtainable, its cost is as great as that of a pressure-treated red oak tie of the same dimensions, if not greater. In paved city track such white oak ties, if not disturbed, may be expected to last as long as the rail, where the life of the latter does not greatly exceed fifteen years, but it would certainly not be safe to replace another rail on these same ties. On the other hand, this is entirely feasible in the case of a properly treated tie, even in the case of relatively inferior grades of wood, as we know they have a life of from 25 to 30 years under such conditions.

Climate Affects Life of Ties

Of course, sub-soil and climatic conditions materially affect the life of an untreated tie, and these must be taken into consideration in selecting the kind of timber to be used. We also have reason to believe that the best quality of untreated timber which is being supplied today cannot be expected to give the same length of service as has been secured from the same class of untreated timber cut from virgin forests in years gone by. Lumber might prove fairly satisfactory for certain soils and localities, but would not be at all satisfactory in many others. Then, too, the availability of certain local timber close to the point of use is another controlling factor. The observations made by the U. S. Forest Bureau and by many of the larger railroad companies have fairly well established the relative serviceability and longevity of the various kinds of timber used for ties; and, with these data available as they are, the user must then apply his own local-condition factors in deciding how far afield he can afford to go in order to obtain timber of a better grade.

With reference to the kind of preservative which should be used, I feel that this is a question which the individual must decide for himself. Personally, I favor Grade No. 1 creosote oil for pressure treatments, although I know of some very satisfactory results from the use of both water-gas-tar oil and coal-tar distillate. My position at this time is not to attempt to argue for any one type of preservative, but simply to go on record as favoring some form of preservative treatment, on the principle that half a loaf is certainly better than none. The only word of caution I wish to add is that some preservative treatments do not lend themselves to electric railway track construction, because of their effect in accelerating electrolytic action and corrosion of the rail and fastenings. One problem to which the wood preserver should devote a great deal of thought is that of reducing the manufacturing cost of wood-preserving oils. This will do more than anything else to increase the use of preservative treatment by the electric railways.

General Agreement Regarding Tie Dimensions

A survey of tie practice of 196 companies, members of the American Electric Railway Association, representing 28,086 miles of single track, indicated that 86 per cent of the total mileage replying used ties 6 in. in depth, 77 per cent used ties 8 in. in width, and more than 64 per cent used ties 8 ft. in length. By far the largest part of those who did not use 8-ft. lengths specified 7-ft. lengths. Approximately 84 per cent of the mileage reporting was standard gage track, the remainder from 3 ft. 6 in. to a maximum of 5 ft. 4½ in.

I quote the above data to emphasize the rather genera
agreement among the electric railways with regards
the matter of wood tie dimensions. The divergence fro
standard gage is limited to a relatively few companie
representing but a small percentage of the entire
dustry; and, in most cases where the gage differs fro
standard, an 8-ft. length of tie is used.

The essential difference between the requirements f
a wood tie in paved track and one for open track is th
for the latter the expense of replacement is relative
small compared with that in paved track, and the co
sequential effect of tie failure does not make itself f
in other elements of the track structure to the same e
tent as in paved track. Therefore, it is essential th
only the longest-lived timber, and that which will provi
the greatest spike-holding power, be used. Otherwis
premature loosening of the rails, with the certain serio
damage to the pavement, and ultimately the entire tra
structure, is bound to result. Then there is the matt
of rather close conformity to the nominal dimensio
The trench for an electric railway track is excavat
closely to given dimensions in order to disturb the mi
mum amount of the adjoining pavement. Sometim
there is laid a concrete base in the bottom of this tren
on which the track is afterward built. In either case
is essential that the length and depth of the ties be ke
quite close to the nominal dimensions specified.

Initial Compression a Problem

There is one other factor in track construction whi
it might be well to discuss at this time, which is impo
tant in any type of track, but particularly so in track
paved city streets, where subsequent maintenance oper
tions at relatively frequent intervals is so expensive as
be prohibitive. Even when sawn ties are used and
plates are employed to better distribute the load over t
tie, it is impossible, when spiking the rail to the tie,
eliminate all of the factors which are responsible for
slight initial loosening of the rail when cars are fi
operated over the track. There is a certain amount
compression which this loading will cause that tends
bring the rail base and plate into more intimate conta
with each other. It also compresses the wood fibers u
der the tie plate and seats the tie plate more solidly
the tie to the point where the natural resiliency of t
wood is brought into play and further loosening of t
rail fastening is materially retarded. Some woods
much better in this respect than others. White oak, f
example, is probably the best, but it is not so suscepti
to treatment as many other woods of inferior quali
It would be of material value to the electric railw
engineers if the tie producers would develop accura
data along this line for various kinds of wood and f
different surface finishes and for different methods
fastening the rail to the tie.

The switch tie problem will probably never be a serio
one with the electric railways for their track in c
streets, for the reason that the trench in which the tra
is installed is of such dimensions, and the special trac
work layouts frequently so complicated, as to make
impracticable to use long ties, due to the difficulty
installing and replacing them. For this reason the maj
ity of the electric railways will probably continue to inst
their special trackwork layouts on standard length cro
ties interlaced as may be found most practicable. T
general use of mechanical tamping machines has ove
come the difficulty previously experienced of tampi
ties in special trackwork layouts.

Keeping Cars Fit in Vancouver

ritish Columbia Electric Railway repaints cars on 70,000-mile basis, using enamel system

WHEN a street car of the British Columbia Electric Railway, Vancouver, B. C., has traveled 70,000 iles, which takes approximately eight months, it is held rom service for entry into the overhauling shops.

When the car comes in to the shop it is lifted off its rucks, which are delivered to the mechanical department omplete. Next the body of the car is lowered onto ummy trucks and towed into the carpenter shop. Here ll the windows are removed and workmen go over the oors, floors, seats, and other portions of the car, com- leting necessary repairs. Then the car is transferred nto the paint shop. On arrival every portion of the ar is washed and scraped where necessary.

To facilitate the work the car is placed on its own rucks when it enters the paint shop. Body and trucks re painted at the same time, a spray being used on the rucks. The body painting is done by hand, five coats eing used. The process takes approximately seven days rom the time the car enters the carpenter shop until it eaves the paint shop.

The material used for painting the car bodies is a fired enamel. About 5 gal. are used on city cars. In ddition, 1½ gal. of sash color, 1½ gal. of ivory paint and ½ gal. of dull semi-finished varnish are also needed. It kes 160 hours to complete this portion of the reconditioning. The cost, including material and labor, is about 210. Interurban cars cost one-third more to paint and econdition than city cars.

In addition to painting the cars, 170 trucks and service ars are painted in the shop. The motor coaches operated y both the B. C. Electric Railway and its subsidiary, e B. C. Rapid Transit Company, go through the same rocess as is used on the cars, except that in the Rapid ransit Company's coaches the upholstery is cleaned. he coaches come into the paint shop approximately very 90 days. The average output of the shops is nine ars per month. Seven painters and five helpers are mployed continuously on this work.

While the paint shops are situated at Kitsilano along ith the mechanical department, the paint shop is entirely separate to prevent floating dust from settling on the newly-painted surfaces. The shop is not heated by the fan system but has steam coils throughout. The object of this is to eliminate air currents which might carry dust through the shop. The heat can be varied from 0 to 100 deg. The stock room has a capacity of two months' supplies of paints, varnishes and oils. It has a concrete floor and 22-in. galvanized-steel plates around the walls at a height of 6 ft. The benches are also covered with galvanized steel, so that the paint and oil can be readily removed. This is done by washing them every night with paint remover.

To assist the painters, scaffolds mounted on wheels have been made. They are constructed of light-angle sections and can easily be moved by two men. They vary in height from 2 ft. 6 in. to 8 ft. 6 in., there being three platforms in all, with railings around the outside to protect the workmen. Each scaffold will accommodate three men at one time.

Mirror for Inspecting Converter

By S. M. Spindle
Engineer Power Department Cleveland Railway
Cleveland, Ohio

WHEN repairing, inspecting or removing foreign objects from the interior of a synchronous converter armature, it is frequently desirable to be able to see the inner surface of the armature coils; i.e., the surface exposed to the armature spider. In the compactly built machines of today this is virtually impossible by direct vision.

To fill this need the electrical maintenance division of the Cleveland Railway has developed a device consisting of a mirror, 3x5 in. in size, mounted through small worm gearing to a hollow tubular handle. By turning a knurled knob at the end of the handle the angle formed by the face of the mirror and the handle may be altered as desired. With the mirror inside the armature and the handle projecting out between the commutator spider arms a very comprehensive view of the interior may be easily obtained. A small lamp is rigidly attached to the handle in such a way as to illuminate the surface to be inspected, but not to shine upon the mirror. The wires are carried through the tubular handle to the lamp.

Interior of paint shop of the British Columbia Electric Railway. Both cars and buses are refinished. The gallery at the right is used for sign repairs

Look for the
PRIZE WINNERS
in the
June Issue

AT A MEETING of the judges in Electric Railway Journal's Maintenance Contest, to be held at association headquarters in New York on May 7, 1929, the second group of prize winners will be announced. There is a separate prize of $25 for the best item submitted from each department—equipment, track, electrical and bus.

Are you overlooking this opportunity to be identified with the progressive maintenance men of the industry? Entries are now coming in for the next group of departmental prizes. There is still plenty of time to join the ranks of those who are cooperating in this effort by the Journal to raise the standards of local transportation maintenance.

Items submitted now will be judged for the third group of individual $25 prizes. They will also be eligible for the annual cash prize of $100, for the departmental certificates of merit and for the annual company maintenance trophy.

If you want to arouse interest in your department and company in going after these awards (in addition to the cash prizes) write to the Journal for printed folders giving full details of this greatest maintenance competition in the history of the industry!

There is no limit on the number of items that can be submitted by any individual, department or company. Nor is "fine writing" necessary. Just write a letter describing methods or devices used in maintenance work that save time and labor or improve workmanship. Your item does not need to cover something unusual or novel. A better method of doing an old job, or a simple jig, fixture or tool that saves labor and time, may win one of these prizes. Be sure to inclose a photograph or sketch illustrating your idea, *and write "Maintenance Contest" at the top of your letter.*

The Journal pays $5 for every item published, even though it does not win a prize. Make your maintenance ideas pay dividends by passing them along to the other fellow! Don't watch others romp off with these prizes. There may be several winning ideas that have been knocking around your department for months. Send them in now!

Electric Railway Journal Maintenance Data Sheet

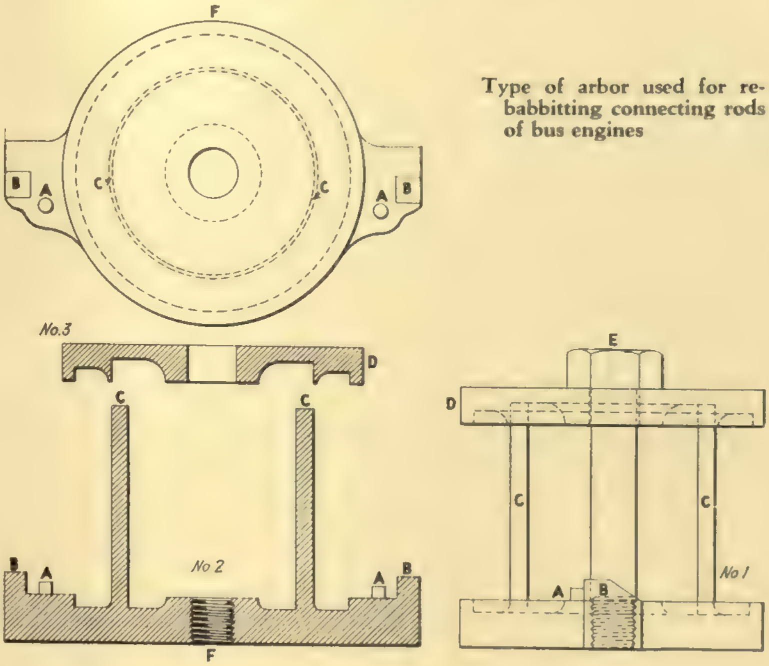
BUSES AND TRUCKS—26

Rebabbitting Connecting Rods for Bus Engines*

By F. A. Marsh
Superintendent of Equipment
St. Petersburg Municipal Railway
St. Petersburg, Fla.

WHEN it was found expensive and unsatisfactory to get bus engine connecting rods reconditioned outside the shop of the Municipal Railway of St. Petersburg, Fla., an arbor for babbitting was designed. This consists of three parts: a base with a circular portion extending upward, a cap and a $\frac{1}{2}$x$2\frac{5}{8}$-in. hexagonal head capscrew. To allow air to escape and for replacing any babbitt which may be lost in leakage the connecting rods are drilled with two holes. A $\frac{1}{8}$-in. hole is drilled parallel to the stem for the air and a $\frac{1}{4}$-in. hole is drilled to the top bearing portion for babbitt.

Rods are cleaned thoroughly and then tinned. Shims, 0.005 in. thick,



Type of arbor used for rebabbitting connecting rods of bus engines

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*Submitted in Electric Railway Journal Prize Contest.

(OVER)

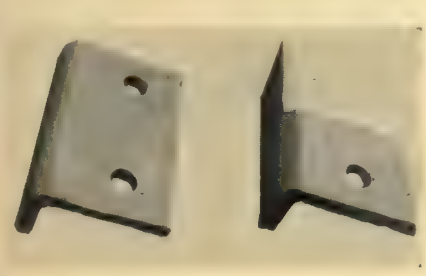
Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—16

Rail Clips for Emergency Repairs*

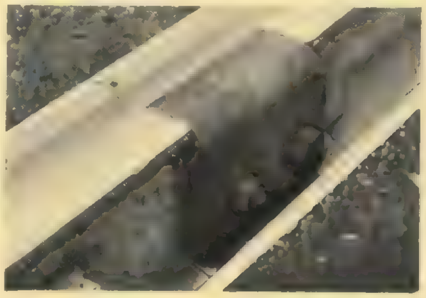
By F. W. Drowley
Roadmaster Way Department
Toronto Transportation Commission,
Toronto, Canada

FREQUENTLY on lines of the Toronto Transportation Commission the head has broken off from old girder rail in tangent track which is about due for replacement. Due to the short car headway or other conditions of vehicular traffic, it may not be possible to do a proper repair job at the time. It is the practice, therefore, to use a temporary clip which is bolted to the rail and replaces the broken section of the railhead.



Repair clips for broken rail

Clips of various lengths are carried by the emergency trucks and are fastened in position quickly by standard splice bar drilling, with large machine bolts to replace the regular track bolts. In cases where rail ends have broken in cast bound frogs or crosses, it is necessary to cut off about 3 in. of the ball outside the casting and drill a hole in the web to bolt the clip in place. Washers or shims are placed between the web and the clip to hold the gage line of the clip to proper location.



Repair of a broken rail made with a rail clip

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*Submitted in Electric Railway Journal Prize Contest.

Electric Railway Journal Maintenance Data Sheet

BUSES AND TRUCKS—26

Rebabbitting Connecting Rods for Bus Engines—Continued

are used in assembling, and blind nuts instead of standard to avoid getting babbitt in to the threads of the studs. With the rod in the arbor and the babbitt at proper temperature the assembled parts are pushed down in the hot babbitt to a depth of 6 in. and stirred around thoroughly. A wooden box about 12 in. square and 8 in. deep is filled with damp sand, in which a depression is made of a size slightly larger than that of the rod with the arbor attached and to a depth of about 5 in. When the rod is withdrawn from the babbitt it is placed in the sand, which is then packed around it an inch or so higher than the arbor. A riser of babbitt is then poured in the depression with a ladle to insure a perfect rod regardless of shrinkage or leaks.

When the babbitted rod has cooled to a temperature less than 100 deg. F. it is taken out of the sand and the arbor is removed. The only machining operation necessary is boring out $\frac{1}{16}$ in. or so and relieving the sides for the oil ways.

The arbor shown in the accompanying illustration is designed with lugs and pins at A and B to rebabbitt Yellow Coach Model X rods. The same type of construction, however, can be used for other types. The flanges and fillets being babbitted do not need machining, and when the blind nuts are removed and standard nuts replaced the rod is ready for what little machining is necessary. If extreme care is used in making the arbor, the cost of about $4.50, will be repaid in the class of work and low cost of machining which results. If many rods must be rebabbitted several outfits would increase efficiency.

By this dipping process the rod and babbitt are of equal temperature and the bearing is free from air bubbles, dross and dirt, and when the rod is held up on one finger by the wrist pin end and struck with a piece of metal, it will give out a clear metallic ring. This shows perfect adhesion between the babbitt and rod.

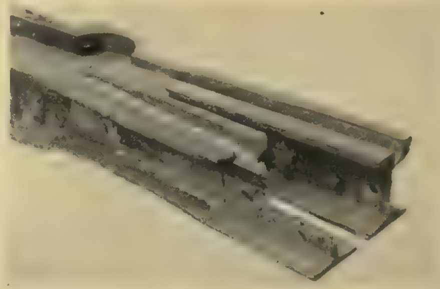
Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—47

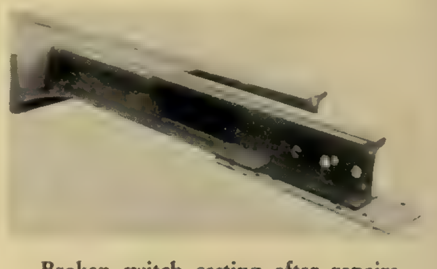
Repairing Broken Ends of Manganese Track Castings*

By R. J. Fennell
Assistant Roadmaster Toronto Transportation Commission, Toronto, Canada

DUE to fracture along the bolt holes it has been necessary to remove from service on lines of the Toronto Transportation Commission several switch and mate castings from the ends of which the ball and part of the web had been broken. Ordinarily, these castings would go to the scrap heap, although they might have given from five to ten years' further service had it not been for the break. A method of rehabilitation has been developed whereby the broken surfaces of the ball and web are evened up by grinding and then a short length of similar rail shaped to fit this surface and the whole seam welded with the metallic arc. Finally, a pair of $\frac{3}{4}$-in. plates is applied and they, in turn, are seam welded at the top and bottom. The accompanying illustration shows the method of repairs.



Broken joint in the straight heel of a switch



Broken switch casting after repairs have been made

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*Submitted in Electric Railway Journal *Prize Contest.*

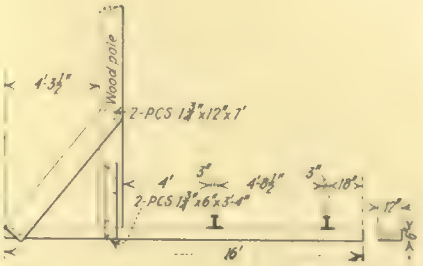
Electric Railway Journal Maintenance Data Sheet

LINE—14

Overhead Poles Supported on Long Ties*

By Angus G. Scott

Assistant Superintendent of Overhead Lines
Cleveland Railway, Cleveland, Ohio



Method used for fastening wood pole to tie

For dump tracks where the rails are being shifted as the fill progresses, the Cleveland Railway has found it advantageous to support the overhead by wood poles mounted on extra long ties. Formerly the poles were set in the ground, and whenever the track was shifted it was necessary to reset the poles and replace the overhead.

With the new method of attaching the poles to the ties it is unnecessary for the overhead department to make any changes when the track is shifted. The track crew automatically shifts the overhead along with the rail, thus avoiding the expense of digging new holes and transferring poles and equipment.

The accompanying illustration indicates how this idea can be used to advantage, and the sketch shows the method of attaching wood poles to the extra long ties. Two double braces are spiked to each side of the pole and tie, and the pole in turn is spiked to the tie. The bottom plates are nailed to the tie and pole butt. Any suitable planking may be used. To hold the wire tight a counterweight, insulated several times from the trolley, is attached to the end pole, which is in turn mounted to the last tie. Any slack which may occur in the line is then taken up automatically. The economy of this operation is readily apparent, and, of course, depends upon the number of times the track is shifted, and the number of poles involved.

Overhead construction supported by poles mounted on long ties on temporary track at Cleveland

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**Submitted in* Electric Railway Journal *Prize Contest.*

Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—48

Track Switch Box Support*

By W. J. McCallum

Foreman Way Department
Toronto Transportation Commission,
Toronto, Canada

Due to the increasingly heavy loads imposed by vehicular traffic many bolted-on switch boxes on the tracks of the Toronto Transportation Commission have been broken off from the casting. In this condition they drop below the level of the pavement, especially at the outer edge. To overcome this trouble a lug has been incorporated in the switch box casting so that it rests on the top edge of a 3x3x½-in. angle, the latter being welded to the lug. The angle in turn is supported by adjacent ties.

Type of support used for switch boxes of the Toronto Transportation Commission

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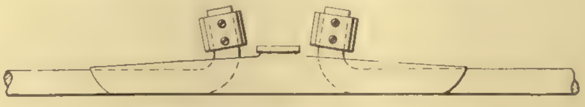
**Submitted in* Electric Railway Journal *Prize Contest.*

Electric Railway Journal Maintenance Data Sheet

LINE—15

Emergency Splicing Ear*

By Julius E. Reifschneider
Engineer Ithaca Traction Corporation, Ithaca, N. Y.



Emergency trolley ear in use by the Ithaca Traction Corporation

For splicing broken trolley wire which is too old and worn to be deserving of permanent repair, a convenient emergency ear is used by the Ithaca Traction Corporation. This consists of an ordinary trolley ear with a hole drilled on each side of the boss. The ear is placed at the break with the broken ends of the wire projecting upward through the two holes, as shown in the accompanying illustration. Clamps are attached to the projecting ends to hold the wire in position. While not suitable for use as a permanent repair job, this emergency ear has proved convenient for temporary use on account of its cheapness and of the ease of installation. Such ears are always carried on the line car.

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*Submitted in Electric Railway Journal *Prize Contest.*

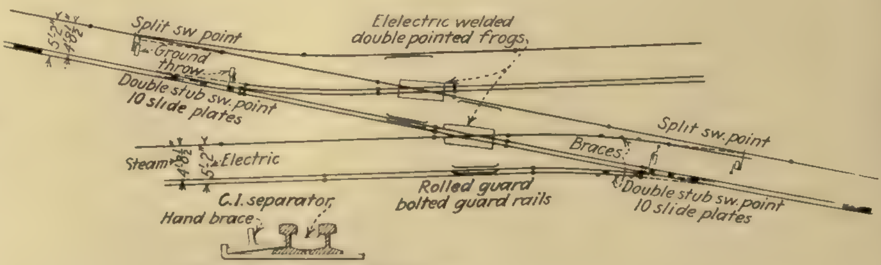
Electric Railway Journal Maintenance Data Sheet

TRACK AND WAY DEPARTMENT—19

Double-Gage Crossover Relieves Congestion*

By C. B. Hall
Chief Clerk Mechanical Department Virginia Electric & Power Company, Norfolk, Va.

Considerable congestion occurred in the yards of the Virginia Electric & Power Company, because the track gage for the electric cars is 5 ft. 2 in., while that for steam railroad cars which deliver material is 4 ft. 8½ in. To remedy this condition certain tracks were equipped with double rails and a double-gage crossover was installed. This has brought about a yearly saving of $300 in hauling fees alone, and has speeded up the unloading of freight cars materially.


5'2"
4'8½"
Split sw point
Elelectric welded double pointed frogs
Ground throw
Double stub sw. point 10 slide plates
Split sw. point
Braces
Steam
4'8½"
5'2"
Electric
C.I. separator
Hand brace
Rolled guard bolted guard rails
Double stub sw. point 10 slide plates

Section Through Double Stub Sw.
Showing Special Slide Plate and Brace

Double-gage crossover used in the yards of the Virginia Electric & Power Company

The design and construction of the double-gage crossover was carried out by J. C. Newman, engineer maintenance of way, for the company. Installation of a reversed split and stub switch on each turnout of the crossover completes the through service over a change in track gage. The special double-pointed frogs were made up of old 70-lb. T-rail welded together at the seams. The cost of the crossover was approximately $400. Labor was the major item, since other parts were made of second-hand material.

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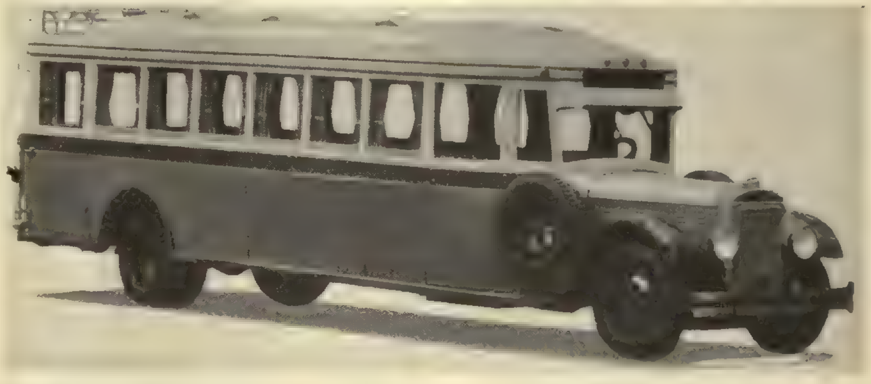
*Submitted in Electric Railway Journal *Prize Contest.*

New Offerings of USEFUL Equipment

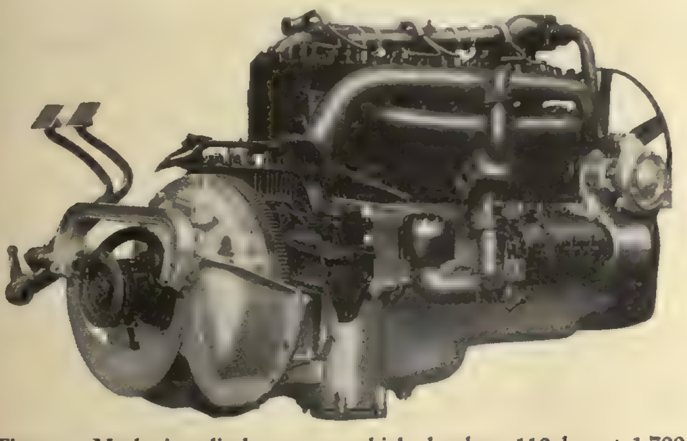
New Mack Bus Has Low Engine Speed

IN A NEW Mack bus recently put on the market, the motor has a 4½x5½-in. bore and stroke, and is suspended at four points in Mack Rubber Shock Insulators. Although 110 hp. is developed, the engine speed is kept as low as 1,700 r.p.m. The six cylinders are cast in block having removable heads in pairs. The crankshaft is drop forged, case hardened and counterbalanced with integrally forged counterweights. Fuel feed is optional and electric pumps, vacuum tanks, or both, are available. Carburetor is of Zenith double venturi type, model 105 DC, 1¼ in. The capacity of the gasoline tank is 80 gal., being mounted on the right side in a cradle suspended on three rubber shock insulators.



The Parlor body on the 233-in. wheelbase chassis will accommodate 29 passengers, while the 265-in. wheelbase type can carry a parlor body for 33 passengers

Final drive is of the dual reduction type, having a full-floating rear axle, with a one-piece banjo drop forging of heat-treated chrome-nickel steel. Model BK is available in two standard wheelbases, 233 and 265 in., either of which is suitable for city type or parlor car bodies. The 233-in. chassis equipped with a 96-in. city type body, having seat centers of 30 in., will accommodate 29 passengers, or with seat centers of 28 in., 33 passengers may be accommodated, while the 265 in. wheelbase chassis will accommodate 37 passengers. The 265-in. chassis, equipped with parlor car body having 30-in. seat centers, will accommodate 33 passengers, or with seat centers of 34½ in., 29 passengers may be accommodated, even with the use of reclining chairs or other similar models.



The new Mack six-cylinder motor, which develops 110 hp. at 1,700 r.p.m., is cast in block with removable heads in pairs

Rubber shock insulation, is used to an extent even greater than heretofore. Not only are the spring tips secured to the frame by blocks of live resilient rubber compressed into steel boxes, replacing spring shackles pins and bushings, but similar means are employed for the suspension of the radator, the engine, the transmission, the gasoline tank, the steering column and the front bumper.

Four-wheel brakes of the expanding mechanical type enable model BX to travel with safety at high speed. Augmenting these brakes is the vacuum booster attachment by means of which additional power may be exerted on all four wheels with but little effort on the drivers part. The total braking area of both sets is 759 sq.in. and of the hand brake, which is mounted separately, 144 sq.in.

Water-Cooled Carbon Electrode Holder

FOR heavy-duty welding by the carbon-arc process, a new water-cooled carbon electrode holder is announced by the Lincoln Electric Company, Cleveland, Ohio. This is designed primarily to insure greater comfort and less fatigue for the welder. With this type of holder it is possible to weld with the arc tip of the carbon electrode projecting less than 3 in. from the carbon-holder. Consequently, there is less carbon area heated, thereby reducing the vaporization of the carbon. Smaller carbons can be used with higher current density, which effects a saving in electrode costs.

The weight of the new type holder is 3¼ lb. The hose which carries the water is also used to carry the cable to the holder. Each of the two water tubes contains a small light cable from the connector to the holder. The water flowing through the holder also acts as a cooling agent for the cable. The carbon-holder consists of coiled copper tubing through which water circulates. The carbon electrode is

Water-cooled carbon electrode holder

inserted through the tubing. A hand shield of compressed magnesium protects the operator's hands from the arc rays. The water-cooling system is incorporated in the hand grip of the holder to keep it cool.

◆

Recent Developments in Atomic-Hydrogen Welding

By Peter P. Alexander
Thomson Research Laboratory
General Electric Company

RECENTLY a new method for atomic-hydrogen welding has been developed in the laboratories of the General Electric Company. The apparatus used is simple, consisting of a support to hold the tungsten electrodes and two tubes directing a hydrogen flame around them. All energy which is supplied to the weld is from the electrical circuit, while the gas serves only to shield the electrodes, to protect the metal from oxidation, and to increase the efficiency of the arc.

There are several processes using the indirect arc for welding, but they are inefficient. It is only when air is replaced by hydrogen that the efficiency of the process of indirect arc welding is increased to such a degree that it becomes a successful process. All the energy is coming from the electrical circuit, so it is essentially an electrical welding method and yet it possesses all the characteristics of a gas-welding process. This process is adaptable to the welding of thin materials. Another field of its application is welding of special alloys and those with a low-melting point. Since in the atomic-hydrogen process the electrodes are non-consuming, the material can be added to the welded plate from a special welding rod of any desired composition. If it would be attempted with direct arc, it would be found that if the electrode has high chromium or carbon, it is almost impossible to maintain an arc. However, if the arc is maintained independently, this rod could be used quite easily.

The importance of aluminum and other light alloys is increasing. It is almost impossible to weld these alloys with the direct electric arc, although they can be welded with gas. On account of a very low-smelting point of these alloys when arc is established between the electrode and the plate, much of the metal is vaporized, but with indirect arc the temperature may be easily kept within the desired limits.

Hydrogen protects the alloys from oxidation. The greatest obstacle for welding aluminum, however, is the formation of aluminum oxide, which prevents the metal from running together. With atomic hydrogen welding, it is possible to weld aluminum under certain conditions without the danger of forming aluminum oxide, and it is even possible to reduce the aluminum oxide already formed to its metallic state. Still, it is not practical at the present time to use the atomic-hydrogen welding process for welding thin aluminum sheets without fluxes, on account of the desire to maintain a high speed of welding the thin materials. In practical applications of the torch for welding thin aluminum sheets, it has been found necessary to use additional fluxes.

◆

Spring-Cushioned Rattan Seats

COMFORT and durability are the features claimed for the new rattan and leather seats No. 201-E, designed by The J. G. Brill Company, Philadelphia, Pa. These seats are unusual in construction in that they are upholstered in a combination of rattan and leather. The cushion, which is of the spring-edge type, 18 in. wide, $4\frac{1}{2}$ in. deep at the front a rear and $5\frac{1}{2}$ in. at the crown, is u holstered in canvas-lined rattan top and edged all around with bro taxi grain leather. This leather fa ing, while adding to the appearance the seat, serves the more useful pu pose of providing a flexible edge f the spring cushion, thus allowing t deep spring-edged type of constru tion and providing a more co fortable and durable seat than po sible with an all-rattan upholster Another advantage claimed for th seat is the elimination of complair by women passengers resulting fro torn clothing which would be caus by projecting pieces of broken ratt on the edges of the ordinary ratt cushion.

The back of the seat is upholster in rattan. The aisle and wall plat and pedestals are of pressed ste These seats were first designed f the eighteen cars recently furnish the city of Phoenix, Ariz., by t American Car Company. As t Phoenix cars are of the double-er construction, the seats are of the r versible type.

The leather facing provides a flexible edge for the deep spring cushion

◆

High-Conductivity Lips for Trolley Ears

WITH the idea of lowering ove head line maintenance cost b reducing the arcing and burning trolley ears, the Westinghouse Ele tric & Manufacturing Company ha developed their new "Champion trolley ear. Experience shows tha trolley ears burn out rather tha wear out by the abrasion of the tro ley wheel or shoe. If the materi used in the lips of the trolley ear ha a conductivity equivalent to the tro ley wire used, some of this burnin will be eliminated. This is accom plished in the "Champion" ear b using lips made from bronze or cop per sheet having high conductivity This sheet is blanked and shaped wit loops formed on the top into whic an aluminum-copper alloy of ver high strength is cast by the perma nent mold method. This assures metal under the trolley wire of hig conductivity and also a strong boss These ears are manufactured in 9-in and 15-in. lengths for Nos. 00, 00 and 0000 round wire.

New trolley ear with high-conductivity copper lips

NEWS *of the Industry*

Fare Increase Sought

ompany in Portland, Ore., wants 10-cent cash fare. Five-year comparative income statement

FACING declining revenues, increasing operating expenses and taxes, d increasing capital investment, the rtland Electric Power Company, Portld, Ore., filed on April 22 with the Public rvice Commission a new tariff calling r an increase in the basic adult fare on y lines from the existing 8-cent cash d six tickets for 45 cents to a straight -cent cash fare. The tariff also calls r an increase in school children's tickets om 25 to $1 to twenty for $1. The isting 8-cent fare was put into effect ly 1, 1922, when it was increased from cents. The step from 5 to 6 cents was ken on Sept. 15, 1918, these two ineases being the only ones ever asked the Portland company. Under the wly-filed tariff universal transfer priviges are to be continued.

The new tariff was accompanied by a tition by Franklin T. Griffith, president, ting forth in full the reasons why ref from a situation rapidly growing inerable is desired. Showing that the e of return on the capital invested in lway property has steadily declined from ar to year from 4.01 per cent in 1924 1.31 per cent in 1928, the petition states at the company faces "confiscation of property and demoralization of the vice" if relief is not granted, and invites public hearing where interested persons y have the opportunity to examine all gles of the problem.

The communication contained a comparate income statement for the years 1924 to 28, and elaborated at some length on the tors influencing the decrease in annual operating income of $517,000 in that iod. The decline in gross revenues was arged principally to the increased use of private automobile; the increase in erating expenses, in spite of labor saved ough an increasing use of one-man cars, the expense of operating unprofitable itions to service forced on the company the absolute necessities of a growing mmunity. The increased capital investnt involved in these service extensions, ich have been effected largely through lines, has amounted approximately to 0,000 in the four-year period, an item tributing to the decreasing rate of ren. A reconstruction program facing company in the near future is cited as added reason for immediate relief.

Preliminary announcement of the fare increase asked by the company was made to a group of prominent Portland business men by Mr. Griffith at a luncheon meeting, April 19, in which the reasons for the increase were fully discussed.

MPARATIVE INCOME STATEMENT OF CITY LINES OF PORTLAND ELECTRIC POWER COMPANY

ar	Gross Revenue	Operating Expenses	Bridge Rental	Taxes	Total Expenses and Taxes	Operating Income	Average Invested Capital	Rate of Return Per Cent
24	$4,874,681	$3,658,111	$97,604	$339,127	$4,094,843	$779,837	$19,459,967	4.01
25	4,835,977	3,682,582	98,181	289,960	4,070,724	765,253	19,676,919	3.89
26	4,755,770	3,753,060	95,951	325,740	4,174,751	581,018	19,830,388	2.93
27	4,630,431	3,729,748	94,645	358,045	4,182,439	447,992	19,936,384	2.25
28	4,523,475	3,789,850	91,496	379,218	4,260,565	262,909	20,050,846	1.31

Depreciation included in operating expenses is depreciation found by Public Service Commission for rail les plus depreciation on buses.

Harley Johnson Safety Awards

A new safety record was established by employees of the Chicago Rapid Transit Company during 1928, when less than $3\frac{1}{2}$ per cent of the 5,848 men and women in service sustained lost time or disability injuries.

Employees of the transportation department of the elevated line set a new high mark with only 80 disability injuries in a grand total of 57,227,346 car-miles operated during the year—an average of 715,342 car-miles per disability injury. In addition to being the best safety mark in the history of the company, it is one of the most remarkable of the kind ever recorded.

The North Side division led all other divisions of the transportation department, operating "L" trains an average of 1,109,796 car-miles—more than $44\frac{1}{3}$ times around the world—for each disability injury.

With a view to promoting even higher safety standards on the "L" lines, four shields donated by Harley A. Johnson, general manager, will be presented to the departments establishing the best employee safety records each six months of the year. These trophies will be awarded on Jan. 1 and July 1 of each year. They will be known as the Harley A. Johnson Awards for Accident Prevention.

◆

$5\frac{1}{4}$ Per Cent Interest for New York Subway Notes

Controller Berry, of New York City, has announced that the new subway construction notes, on which he is about to call for bids, will bear interest at the rate of $5\frac{1}{4}$ per cent. These are four-year notes, complying with the Board of Estimate's policy, under which the city will raise out of taxes a large part of the money it needs for the construction of the new municipal subway.

The amount of the present issue is $52,000,000; it is part of a total authorization of $318,000,000. The first instalment was marketed a year ago, after the controller, in a court action, had unsuccessfully opposed the decision of his colleagues. At that time the rate was 4 per cent.

New Franchise in Albany, Ore.

The city of Albany, Ore., has awarded a franchise to the Oregon Electric Railway for a railroad link over the streets and sidewalks of Albany within the area bounded by its present track and the Southern Pacific line on the north and south and by Main Street and the eastern city limits on the west and east. The motive power will be optional in the new franchise as the former franchise specified electrically-driven cars. The term of the grant is 50 years, superseding the old one held by the Oregon Electric Company, which expires in 1937.

A. J. Witchell, chief engineer for the line, states that both freight and passenger service will be permitted. The arrangement is significant in that it will make possible a connection with the northern railway lines and the Southern Pacific in East Albany. Transportation of logs from the timber area in eastern Linn County is the aim. According to Mr. Witchell, new lines between Lebanon and Foster and between Sweet Home and Calapooia have been located.

◆

Trainmen Stirred by St. Louis Company's Statement

A recent exchange of communications between the officials of the local amalgamated union and Stanley Clarke, president St. Louis Public Service Company, indicates the strained relationship that has developed because of the failure of the Missouri Public Service Commission to announce its decision on the wage controversy submitted to the commission for arbitration several months ago.

The new controversy resulted from an article "Will Car Fares Be Increased" that appeared in the April 15 issue of *Transit News*, the official publication of the railway, distributed to riders. This was interpreted by union officials as propaganda on the part of the company preparatory to a drive for a 10-cent fare, regardless of the outcome of the wage controversy.

The *Transit News* article pointed out that fares are largely governed by the wages paid employees, that the 5,500 employees of the Public Service Company are paid a total of nearly $10,000,000 a year in wages, a sum approximately two-thirds of the operating cost. The article contended that the men are receiving higher wages than the average paid in other cities. It expressed regret that the riders could not pass on the wage question similar to the recent vote on the question of whether the wages of the city's firemen should be increased $25 a month, a measure which was defeated.

"Our motormen and conductors have much the same relation to you that the city firemen have," the article continued. "They are public servants, performing a necessary task," etc., concluding higher carfare was equivalent to higher taxes.

The burden of the answer of the representatives of the men was that the plea was "obviously an attempt to prepare the public for a 10-cent fare request and you also improperly seek to shift in advance to the street car men the public criticism you expect from that request."

The company in its rejoinder kept its answer almost entirely to the issue of the adequacy of the pay now being received by the men contrasted with that paid elsewhere.

To this the representatives of the men made reply in a communication in which they took exception to Mr. Clarke's statement "because, like the *Transit News,* it is replete with misleading half-truths, tending to prejudice the public against the street car men."

To this last communication President Clarke declined to reply, saying that so far as the company was concerned the controversy was a closed incident, the company resting its case on the points contained in the statement previously issued.

It is very uncertain when the state commission will pass on the wage dispute.

◆

Levis Banquets H. E. Weyman

Some managers are roasted and others are toasted. H. E. Weyman, general manager Levis Tramways, Levis, Que., is in the toasted class. On April 2, some 150 of his fellow-citizens honored him with a banquet to mark his energetic work as president of the Chamber of Commerce and his fifteenth anniversary in the rescue and upbuilding of the Levis transportation system. With the banquet came a permanent reminder of the occasion in the form of a fine set of tableware.

Mayor LeBlond, toastmaster of the evening, dwelt upon Mr. Weyman's untiring efforts to advance the commercial and industrial progress of the "South Side." As a graceful conclusion, he quoted Longfellow's "Psalm of Life" with its emphasis on "Learn to labor and to wait."

"The hero of the fête," (to translate *Le Quotidien* literally) in a happy reply to the Mayor, said this occasion proved that an overwhelmingly French-Canadian community could take an Anglo-Canadian to its bosom. He hoped that the example of Levis in this respect would be a precedent to others. After thanking his friends for their gift, he discussed the advantages of the Levis district as one offering 12 miles of first-class harbor with the further advantage of being able to build double-deck piers without the necessity of excavation. Since publicity was imperative in these days, the Chamber had distributed broadly during the year the first publication of note on the merits of the district.

Mr. Weyman was followed by Noel Belleau, a noted lawyer who said: "You see before you a man of tranquil mien who labors unceasingly for the good of his community and who is astonished to find that his work is appreciated by all the world." Continuing, Mr. Belleau related how Mr. Weyman had restored the Levis tramways system and made it a matter of community pride; and that when he completed this work, he must have said: "Now I belong to the people," as evidenced by his splendid rejuvenation of the Chamber of Commerce.

The *Chronicle-Telegraph,* of Quebec, the big city opposite Levis, took note of the banquet in an editorial entitled "Levis Forges Ahead." Of Mr. Weyman, it wrote: "He has not only brought the public utility in question to a high station of efficiency but—most unusual feat—has made it a popular institution in the community."

Bootlegging of Rides Prohibited

A LAW passed by the Maryland General Assembly to permit owners of automobiles to transport fellow employees to and from their work for for pay has been signed by Governor Ritchie to become effective on June 1. Car owners who plan to engage in this kind of service will be required to obtain an employees' certificate of convenience from the Public Service Commission, at the same time filing the names and other information dealing with those they plan to transport.

Only those who are not convenient to other means of transportation will be permitted to use this form of travel. Certificates so issued will carry a special license plate from the motor vehicle commissioner to cost $3 a year additional. Each owner of a passenger car so run must carry a copy of the certificate in his vehicle. Owners will not be permitted to transport passengers for pay except as provided in the certificate.

Theatre Party for Metropolitan Section Members

"What Do You Say?" a musical comedy, is the attraction which has been arranged for the entertainment of the members of the Metropolitan Section in New York in accordance with the annual custom of the manufacturers. The theatre party will be held on the evening of May 3 at the Lyric Theatre, New York, 42nd Street west of Broadway. The members of the cast of the comedy are all employees of the Third Avenue Railway. Their services are being donated through the courtesy of Slaughter W. Huff, president of that company. Two tickets to the show will be sent to each member of the section. Since the seats are not reserved, the early arrivals will benefit most. The play will start at 8.15 sharp. Arrangements to present it were perfected under the direction of T. W. Casey, chairman of this year's committee.

◆

$7,000,000 Capital Outlay to Handle 80,000 Stadium Crowd

Cleveland's new civic stadium will cost $2,000,000. Its capacity is estimated at 80,000. Properly to care for the crowds expected to attend the events there will entail an expenditure of $7,000,000 on the part of the Cleveland Railway. President Alexander said that a number of studies of possible rapid transit facilities to handle stadium crowds had been made by the engineering firm of Parsons, Klapp, Brinckerhoff & Douglas in connection with their transportation survey for the Cleveland Railway. He is quoted:

"The most feasible plan is underground operation on a loop starting at the Terminal tracks, north in West 9th Street to Lakeside Avenue, east in Lakeside to East 9th Street and south on East 9th Street to Huron Road, connecting with the Euclid Avenue subway, which would carry the loop back into the terminal area.

"This route would be accessible to surface cars and rapid transit trains from any part of the city. It would cost $7, but the cost would be materially if it were constructed in conjunctio other proposed subways."

Mr. Alexander said the possibility ing the Big Four tracks, which ru the Terminal area at low level ir present Union Depot, had been cons but that he did not think such an ar ment would be satisfactory. He sai

"That would make a stub arrang When one train was loaded another have to back in. Trains can be load dispatched much faster with a loop, there is continuous movement."

◆

Railway Participates in Balti Products Week

The United Railways & Electric pany, Baltimore, did its part towar great success of "Baltimore Pro Week," observed from April 22 to 27, during which almost all the d town stores showed products man tured in Baltimore in their display dows. There were about 300 elab exhibits.

In connection with the event United issued a handy guide which the exhibitors, gave the location of display and recorded the numbers the car lines passing each place o hibit.

The company printed 150,000 o guides. Of this number 100,000 placed in the street cars, 25,000 distributed among the public sc children, 15,000 were distributed to pupils of the parochial schools and 000 were mailed by the United or tributed through the company's bu of information. The company said

"Among the most important of B more's products is safe, econom convenient street car transportation. round figures 300,000,000 such rides produced in 1928. The railway indu of Baltimore, carrying hundreds thousands daily between homes, tories, stores, churches, business off construction projects, theatres— home again—is one of the city's 'es tial industries.' Its products—street rides—are among the city's 'essen products.' Its duty is public serv The United Railways is proud of timore and proud of its opportunity serve Baltimore. Its lines are links tween the homes of Baltimoreans the exhibits of 'Baltimore Produ Week'—every week throughout year."

The company also helped to boost exhibit by displaying dash signs on the cars. These read: "Among Ba more's Chief Products—Street Rides—Nearly 300,000,000 Produced 1928."

It was explained that the 300,000, included revenue and transfer pass gers.

◆

Medals for Safe Driving—Twen four operators of the Pittsburgh Mo Coach Company, subsidiary of Pittsburgh Railways, were award medals at a party given in their hon on March 20. T. W. Noonan, in char of the Pittsburgh Motor Coach Co pany, praised the 24 men and then C. Graham, Jr., manager of the Pittsbur office, Ocean Accident & Guarant Company, presented the medals to t men. There were music, refreshmen and entertainment.

American Standards for Track Bolts and Nuts

Proposed American standards for track bolts and nuts, as recently approved by the sub-committee of the sectional committee of the standardization of bolt, nut and rivet proportions, are ready for criticism. Track and way departments of all electric railways will be interested in this new proposed standard. The proposal is in tentative form for discussion and criticism. Copies may be obtained by addressing C. B. LePage, assistant secretary of the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.

The dimensions given have been determined from data obtained by tests which were carried on under the direction of the sub-committee, and in co-operation with the rail committee of the Engineering Division of the American Railway Association.

The sectional committee consists of 46 members representing manufacturers, consumers and general interests. It was organized by the Society of Automotive Engineers and the American Society of Mechanical Engineers, as joint sponsors, under the procedure of the American Standards Association.

◆

Traffic Studies Planned in St. Louis

Traffic studies to be the basis of recommendations to the Transportation Survey Commission at St. Louis, Mo., are now being made by R. F. Kelker, Jr., Chicago, engineer for the commission.

Initial studies and reports will take up the present railway lines and how that service may be speeded up and existing surface routes be used to a fuller extent.

Mr. Kelker will work out a plan for rerouting street cars in the downtown section without increasing trackage. The existing downtown lines are now taxed to their maximum capacity in the morning and evening rush hours, while many important lines that, it is felt, should enter this district directly, now merely skirt it. In a maximum half-hour in the afternoon, 331 cars enter the district bounded by Ninth Street, Washington Avenue, Fourth and Pine Streets. It is said that Mr. Kelker hopes through rerouting to bring a maximum of 349 cars into this section in the maximum half-hour.

Preliminary studies have revealed that the average speed of the St. Louis street cars compares very favorably with that of cars in other cities. It has been found that the lines with modern cars and facilities for quick loading and unloading of passengers and quick acceleration and retardation have much higher speed averages than the lines with old equipment.

As is well known Mr. Kelker contends that before expensive rapid transit facilities are installed, a city should make full and effective use of all existing facilities. He favors subways only as a last resort.

◆

Canadian Association to Hold Silver Jubilee—Montreal has been selected as the meeting place for the Canadian Electric Railway Association. The convention, which will mark the 25th anniversary of the founding of the association, will be held at the Stadium on June 5, 6 and 7. Convention headquarters will be at the Windsor Hotel.

COMING MEETINGS
OF

Electric Railway and Allied Associations

April 29-May 3—Chamber of Commerce of the United States, annual meeting, Washington, D. C.

April 30-May 3—Arkansas Utilities Association, Arlington Hotel, Hot Springs, Ark.

May 1-3—Indiana Public Utilities Association, Indiana Gas Association and Indiana Electric Light Association, annual joint convention, Hotel Gary, Gary, Ind.

May 3—Metropolitan Section, American Electric Railway Association, 33 West 39th Street, New York, N. Y.

May 9—Central Electric Railway Master Mechanics' Association, Lima, Ohio.

May 13-15—National Highway Traffic Association, annual meeting, Stevens Hotel, Chicago, Ill.

May 15—Central Electric Railway Traffic Association, Fort Wayne, Ind.

May 15—Association of Electric Railway Equipment Men, Middle Atlantic States, semi-annual meeting, Wilmington, Del.

May 20-23—National Conference on City Planning, annual meeting, Buffalo and Niagara Falls, N. Y.

June 3-6—National Association of Purchasing Agents, annual convention, Hotel Statler, Buffalo, N. Y.

June 5-7—Canadian Electric Railway Association, annual convention, Montreal, Quebec.

June 21-22—New York Electric Railway Association, Bluff Point, N. Y.

June 27-28—Central Electric Railway Association, Michigan City, Ind.

July 24-26—Electric Railway Association of Equipment Men, Southern Properties, Lafayette Hotel, Lexington, Ky.

July 26-27—Central Electric Railway Accountants' Association, Angola, Ind.

Aug. 15-16—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.

Aug. 27—National Association of Railroad and Utilities Commissioners, Glacier National Park, Mont.

Sept. 28 - Oct. 4—American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium, Atlantic City, N. J.

Rerouting Helpful in Atlanta

Opening of the last unit of the new Central Avenue-Pryor Street viaduct in Atlanta, Ga., has resulted in changes in railway routing by the Georgia Power Company, greatly simplifying traffic through the downtown section of the city.

One of the most important changes has been the rerouting of the Inman Park-Grant Park car line. Formerly this line entered the downtown district on Edgewood Avenue, crossed the north-and-south traffic on Peachtree Street, turned south on Broad, and recrossed the traffic lines on Hunter Street before turning on Washington Street to go to Grant Park.

Wherever possible cars are turned back at the so-called "railway gorge" to make a loop without crossing the downtown section. Where this is not possible, cars have been rerouted to use the new viaducts and relieve the crossings at Peachtree and Broad Streets. Only where absolutely necessary do street car lines now cross from east to west and vice versa.

Consideration of Louisville Increase Deferred

Action in the matter of the fare plea of the Louisville Railway, Louisville, Ky., is not expected for several weeks. The city had 60 days in which to take action, after which, under existing laws, the increase would automatically become effective. The Council did take action, but only to the extent of extending the time for passing upon the matter by 90 days, with the result that the 60-day period is just about ending, and there is the 90-day extension, before action is necessary.

◆

Partial Relief in Iowa

An act partially relieving electric railways of the burden of paving between tracks has been passed by the Iowa Legislature during the present session. It provides as follows:

Street railways shall provide a suitable foundation for the track of a width equal to their ties, but in no case less than the width comprised between lines lying 1 ft. outside of each rail of the track, and shall be assessed for the construction or reconstruction of paving between the rails and for 1 ft. outside of each rail, in the amount that the cost of such pavement per yard of area exceeds the cost per yard of the remainder of the paving upon such street. In the making of assessments for paving, in the event that the track or tracks also are to be paved or repaved, the engineer shall estimate the cost of building such improvement, and he shall also make an estimate of the cost of building such an improvement upon said street as it would be in the event that the street car tracks did not there exist; and the street railway shall be charged with the difference in said estimates of cost and shall pay the same as other special assessments are paid.

Separate bids shall be taken in case of single track upon that portion of the street between the rails and 1 ft. outside of each rail, and in case of double track upon the entire portion of the street included between lines parallel to and 1 ft. outside of the outer rail of each track. The street railway shall be permitted to bid upon this portion of the pavement and the lowest bidder thereupon shall be awarded the contract. One-third of the remaining cost of the improvement for the area between the rails of the tracks of the street railway and 1 ft. outside shall be assessed against the street railway, one-third thereof shall be assessed against the abutting property and the owner, and one-third shall be paid for by the city either out of the improvement fund or general fund.

All repairs or maintenance between and 1 ft. outside the rails made necessary by the operation of the street railway and any other repairs or maintenance made necessary by the operation of the street railway shall be made by the railway and if not so made, the city shall have the power to make such repairs and assess the cost to such company.

The word "paving" as used in the preceding section shall include any kind of hard surfacing, gravel or macadamizing together with the necessary paving base.

The provisions of the act shall apply to cities acting under special charter.

Recent Bus Developments

Railways Dominate Bus Field

Companies in Toronto, Hamilton and Montreal greatly strengthen their positions as common carriers

THE recent acquisition by the Toronto Transportation Commission of four independent interurban motor coach lines, which gives the publicly-owned railway system control of practically every line operating into and out of the Queen City, recalls to the *Canadian Financial Post* similar consolidations which have been effected in Montreal, Hamilton, and on the Pacific Coast.

Last year, for instance, the Ontario Bus Owners' Association undertook to work out a scheme, involving about eight lines in the province, whereby passengers could be routed by motorcoach from almost any point in Ontario to anywhere in the United States, this being made possible by a working agreement with the operators across the border. Gray Coach Lines, Ltd., subsidiary of the Toronto Transportation Commission, was the leader in this scheme. With the purchase of all the bus lines operating as far as Oshawa on the east, Hamilton and Niagara Falls on the west, and all the lines to the north, they have simplified considerably the through-routing of passengers desiring to travel by motor coach because all the lines in this area are controlled by one company.

The same thing applies in Hamilton, where the Dominion Power & Transmission Company, Ltd., has likewise taken over independent lines and have forged the various lines into a strong department of the company. In Montreal, Provincial Transport, Ltd., has also bought out most of the independent operators, and now control motor coach operation in Montreal and vicinity.

Over on the Pacific Coast the Vancouver Island Transportation Company, Ltd., recently established, has taken over twelve coach lines operating in and around Victoria as well as considerable property. It has an authorized capitalization of $500,000 first mortgage 7 per cent debentures, of which $350,000 is issued, and 5,000 shares of common stock of par value of $100 each, all of which are issued.

The purchase of the twelve established motor coach lines included equipment, terminal leases and an exclusive franchise granted by the corporation of the district of Saanich giving the company sole rights to operate vehicles for the carriage of passengers for a twenty-year period. All the old routes have been improved and expanded, and the company is negotiating for further purchases to increase its control of operation on Vancouver Island.

BUY NEW MOTOR COACHES

To return to the Toronto development: Immediately after taking over the four lines, the Toronto Transportation Commission announced the purchase of 35 new coaches, which brings the total equipment operated by the commission up to 221 vehicles. This is made up as follows: Buses and coaches operated prior to the purchase, 171; buses and coaches acquired with the routes, 15; coaches ordered, 35.

Ten of the new coaches are of 17-passenger capacity, with reclining chairs. Fifteen are 21-passenger vehicles, while the remaining ten are 35-passenger coaches, which have a regular seating capacity of 29 with six folding seats extra. All are of the parlor type. The commission expects first deliveries in the second week of May, with final deliveries in the first week of June.

Asked for the reason for the smaller type of coach—the 17-passenger—the manager of the Gray Coach Lines explained that the company intended to give more frequent service with the small-capacity vehicles. The new schedules will be announced soon.

The Toronto Transportation Commission with 221 vehicles dominates the field in Toronto; the Dominion Power & Transmission Company, with the recent acquisition of six lines operating out of Hamilton and in Preston and Galt, is supreme in the Ambitious City; Provincial Transport has acquired 31 lines in and around Montreal and now has a total of 125 buses and coaches; and on Vancouver Island the Vancouver Island Transportation Company practically controls the situation there with a fleet of 46 buses and coaches and prospects of an early increase in this equipment.

No-Parking Speeds Up Baltimore Traffic

NO-PARKING regulations put into effect on Fayette Street, Baltimore, recently, have resulted in speeding up the movement of cars of the United Railways & Electric Company on that thoroughfare. Officials of the company declare that the cars have been enabled to increase their speed between 10 and 15 per cent. Opposition to the banning of parking on both Fayette Street and Lexington Street, which developed before the new rules were put into effect, has subsided.

Another Step in Taggart Tangle

That no additional taxicabs be allowed to operate in Seattle for an entire year, and that present operators be placed under rigid new city regulation, are requests made to the city officials by opponents of Sam W. Taggart and associates, who are seeking an exclusive taxicab franchise. At the suggestion of John E. Carroll, president of the City Council, an amendment to the existing taxicab ordinances is being prepared by T. J. L. Kennedy, corporation counsel. This measure will be in keeping with the views of George B. Avery, superintendent of public utilities, who has sought to preserve competition in the taxicab business under stricter city control over rates and the number of taxicabs in service, instead of granting the Taggart monopoly measure.

Rate-cutting to the point of competition with the Seattle Municipal Street Railway by taxicabs hauling five passengers for one fare has afforded the Taggart interests grounds for one of their strongest arguments for a monopoly.

Jitneys Ordered Off Chicago Streets

Six small jitney companies, which
been operating a total of 75 buses o
northwest side of the city of Chicago
5-cent fare, have been ordered by Mu
pal Judge Damron to cease opera
pending issuance of permits.

Resolutions subsequently adopted by
City Council, however, enjoined the p
from interfering with the operatio
these independent lines.

Alderman Joseph C. Ross argued th
the order were to be enforced the Co
would be showing favoritism to the
cago Motor Coach Company, which
operating buses on Chicago streets
10-cent fare with no authority from
city. To this Alderman Jacob M. A
replied that the Chicago Motor Coach c
pany was protected in its rights b
court injunction.

◆

Additional Bus Service for Provide
—Petitions have been filed with
Public Utilities Commission by
United Electric Railways, Provide
R. I., asking approval of a plan to o
ate buses between Providence
Woonsocket and between Provide
and Crescent Park. Temporary ab
donment of electric car service in Wo
socket and the substitution of buses
were asked. The proposed rebuilding
Main Street, Woonsocket, makes
necessary to discontinue trolley ser
temporarily. If permission is gran
by the state authorities, "the buses
supplement the trolley service." H
long both types of service would
operated the company has declined
say.

Substitution in New Brunswick—P
lic Service Co-ordinated Transp
Newark, N. J., has been authorized
the City Commission of New Bru
wick, N. J., to remove its tracks
overhead structure on Schuyler
French Streets and Codwise Avenue
to abandon the Middlesex line runn
between New Brunswick and Pe
Amboy. Buses will be substituted. Th
will connect with buses operating
tween Plainfield and Metuchen.
date for the substitution has not b
announced.

Buses to Lynchburg's Union Statio
Authority to abandon its railway serv
from Main Street to the Union Stat
in Lynchburg, Va., has been gran
to the Lynchburg Traction & Li
Company, after a hearing before
Virginia State Corporation Commissi
The company will substitute bus serv
An agreement between the company a
the City Council of Lynchburg was p
sented at the hearing. With the pe
tion was filed the answer of the ci
in which the city joins in the petiti
The company is to reroute its Cab
Street bus line to care for travel to a
from the Union Passenger Station. C
are not to be removed from the Uni
Station line until the company provid
new buses for the route.

**Southern Pacific Seeks to Buy Ca
fornia Bus Line**—Permission has be
sought of the California Railroad Co
mission by the Southern Pacific Mot
Transport Company, the motor sta
subsidiary of the Southern Pacific Co
pany, to purchase all of the outstandi
stock of the California Parlor Car Tou
Inc., Los Angeles, for $75,000.

Financial and Corporate

Wichita Reports Presented

Plan taking shape under which local syndicate proposes to take over Illinois Power & Light holdings

REPORTS made by the engineering firm of Black & Veatch, Kansas City, and Clinton H. Montgomery & Company have been submitted to the city of Wichita, Kan. The first, an engineering firm, and the other one, accountants, were employed by the city last fall to make a valuation of the rail lines and to audit the books of the Wichita Railroad & Light Company. With the reports in hand, negotiations have begun looking toward a valuation as a rate base, the fixing of new fares which will apply both to street cars and buses, with a free transfer between, and the working out of a new franchise.

The Wichita properties, namely, the Wichita Railroad & Light Company and the Wichita Motor Bus Company, are under option from the Illinois Power & Light Corporation as of March 1, 1927, to a syndicate in which Messrs. Campbell, Wheeler and Clevinger are interested. This contract gives the Wichita group three years, if necessary, to refinance and purchase the property. Involved in the program is the securing of a new franchise, the working out of a new fare schedule on both street cars and buses, and the rerouting of the latter.

The Wichita Transportation Company was organized as a holding company of the other two companies, but since the street railway was under the jurisdiction of the city, while the bus operation was under the jurisdiction of the Kansas Public Service Commission, the Wichita Motor Bus Company was organized, entirely separate from the original company, the Wichita Railroad & Light Company. Through the Public Service Commission, the company succeeded in getting a new schedule of fares on the buses, as well as a rerouting, the bus fares being 8 cents cash, two for 15 cents, five for 35 cents and 24 for $1.50.

Nearly two years ago, a proposal was submitted to the City Commission asking for an equitable franchise and for an increase in the street car fares to that of the buses. The present street car fare rate is 6 cents cash, nine for 50 cents, resulting in an average fare of 5.88 cents.

The Kansas Legislature last winter passed a so-called, home rule bill, applying to cities of 90,000 people and more, which would vest the jurisdiction over the buses in the City Commission, if and when a franchise were granted to companies operating both facilities. In the Wichita case, the franchise would probably be granted to the Wichita Transportation Company.

◆

Important Deal Rumored in Michigan

Well-substantiated reports are to the effect that the Michigan Central Railroad is closing negotiations with the committee of bondholders for the purchase of the defunct Michigan Railroad's interurban lines between Grand Rapids and Kalamazoo, Battle Creek and Allegan. Executive officials of the Michigan Central imply that the lines would not be bought for operating purposes.

Shipping interests in Grand Rapids foresee in the purchase a cutoff between Grand Rapids and Chicago for westbound freight routed over the Michigan Central. Persons acquainted with the plan say the line would also give the Michigan Central access to a new territory with several prosperous towns that are good shipping points and would obviate the diversion of western freight by way of Jackson, Mich. The property would also give the Michigan Central considerable new trackage and exclusive service to several big mills and industries in Grand Rapids.

The Michigan Railroad's property was bid in by the bondholders several weeks ago at a sale conducted by the United States District Court for eastern Michigan. Announcement of the pending deal came from the interurban headquarters at Jackson, and will be subject to certain restrictions imposed by the court. The deal would include all track, right-of-way and property connected with the two lines. Interurban freight service will be continued for 60 days.

◆

$15,000,000 Bonds Urged

Expert for Detroit municipal railway says system can not keep pace with improvements by financing them with earnings

DETROIT'S municipal railway is charging a fare insufficient to meet the demands that are being made upon the system for extensions and improvements in service, and the Council should be asked to authorize a bond issue of $15,000,000 for the use of the department, John H. Morgan, auditor for the municipally-owned lines, has so informed the members of the Street Railway Commission. The system cannot keep pace with the growth of the city on the present revenue because earnings are insufficient.

For the present construction year the Council has tentatively authorized the expenditure of $5,600,000 for improvements, extensions and new equipment. Mr. Morgan said that this money cannot be obtained from the present revenue of the system. No suggestion was made at the session at which the Morgan report was presented to increase the fare, although figures compiled by the American Electric Railway Association reveal that the average fare in the country is now in excess of 8 cents as compared with 6 cents in Detroit.

In lieu of an increase, Mr. Morgan suggests that the Council be asked to appropriate $15,000,000 to be used by the D. S. R. as it is needed. The street railway department could then use this money to provide better service and also to construct lines to newly-developed sections of Detroit.

Mr. Morgan said that the present method of financing cannot continue, and suggested that the commission go before the Council and "lay all cards upon the table." The city is paying to private interests 6 per cent for money loaned and by bond issue could go out and borrow the money for 4½ per cent he said.

In arguing for a refinancing of the system, Mr. Morgan stated that annually the Michigan Bell Telephone company is spending $10,000,000 in Detroit to keep pace with the growth of the city; the Detroit Edison Company $20,000,000 and the Detroit City Gas Company, $8,000,000.

Mayor Lodge said that the commission, before going to the Council for an authorization for the bond issue, should first ascertain if the system is in a position at the present time to take care of outstanding obligations. When questioned later the Mayor said that if bonds were issued there would be no question but that the revenue from the system would be sufficient to meet interest and sinking fund charges upon the new issue. This would be made possible by the fact that the money now taken from revenue for track repairs, equipment, etc., would be made available for bond retirement and interest.

◆

$29,357,465 Value

City Engineer so reports on property of Market Street Railway, San Francisco in preliminary statement

VALUATION of the properties of the Market Street Railway, San Francisco, Cal., in their present condition is placed at $29,357,465 by City Engineer O'Shaughnessy. This is an increase of $2,991,099 over the figures of 1921, due, according to Mr. O'Shaughnessy, to increase in cost of materials and labor. The final report in eight volumes of 500 pages each is expected to be ready in several weeks. The report just made public is a brief summary of the completed set-up.

Valuation Detailed

Valuation of the lines of the Market Street Railway, upon which the franchises expire this year, according to the city's interpretation, and in 1930, according to the company's contention, show the following:

Reproduction cost new	$9,003,436
Condition, per cent	58+
Reproduction cost new, less depreciation	5,239,569

Mr. O'Shaughnessy's present valuation, as of June 30, 1928, based on Interstate Commerce Commission system of accounting and covering the entire Market Street system shows the following figures:

Reproduction cost new	$46,605,977
Condition, per cent	63
Reproduction cost new, less depreciation	29,357,465

The city engineer says that these figures will require readjustment to make certain allowances, such as the city's interest in the tracks on Ocean Avenue, additions and betterments and changes in inventory since June 30, 1928.

The valuation of June 30, 1921, also made by Mr. O'Shaughnessy, was as follows:

Reproduction cost new	$35,273,442
Condition, per cent	75
Reproduction cost new, less depreciation	26,366,366

$11,000,000 Increase

The difference in cost of materials and labor between 1921 and 1928 resulted in the $11,000,000 increase in reproduction cost new, partially offset by the 12 per cent decrease in condition, giving a final present valuation only $3,000,000 more than in 1921.

The city engineer will also report that the request for a detailed statement on what the city will do in rerouting and improvements, when it takes over the Market Street lines, cannot be made for some weeks, as the field surveys are still in progress.

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$479,226 Surplus in St. Louis in 1928

The statement of the St. Louis Public Service Company and subsidiaries for the year ended Dec. 31, 1928, shows consolidated net income of $972,195 after depreciation, taxes, interest, etc., equivalent after dividend requirements on $7 preferred stock and after deduction of $250,000 for sinking fund requirements, to 66 cents a share earned on 343,620 no-par shares of common stock. This compares with net loss of $108,192 in 1927.

The consolidated income account for the year 1928 compares as follows:

	1928	1927
*Gross earnings	$19,862,058	$19,533,261
Expenses	13,814,110	13,699,189
Depreciation	1,266,128	1,599,021
Taxes	1,889,825	1,851,139
Interest and miscellaneous chrages	1,919,800	2,492,104
Net income	$972,195	†$108,192
Preferred dividends	492,969	....
§Surplus	$479,226	‡$108,192

*Includes non-operating income. †Loss. ‡Deficit §Amount available for sinking fund requirements and common stock.

The balance sheet of the St. Louis Public Service Company and subsidiaries as of Dec. 31, 1928, shows total assets of $78,344,502 and total surplus of $17,970,884. Current assets amounted to $1,656,926 and current liabilities $1,996,985.

Refunding Desired in Seattle

A series of conferences with Mayor Frank Edwards, of Seattle, Wash., other city officials and A. W. Leonard, president Puget Sound Power & Light Company, has been started in an effort to refund approximately $11,000,000 of Seattle's debt for the purchase of the Municipal Street Railway. The plan would cover about 30 years, with annual payment of between $300,000 and $500,000 so that a large part of the railway current earnings may be used for extensions and new equipment.

Under the present arrangement, the city is paying $833,000 a year in principal on the purchase price of $15,000,000, together with interest, which brings the total annual payments close to $1,200,000, and leaves virtually nothing to finance extensions and new equipment. The railway last year was compelled to borrow about $800,000 from the city light and water departments. George B. Avery, superintendent of public utilities, and Councilman A. Lou Cohen induced the last Legislature to pass a special street railway refunding bill for Seattle in the hope that the city might be given approximately 30 years, instead of ten, in which to retire the debt. A. W. Leonard, the city is advised, has full authority to represent both the Old Colony Trust Company, which acts for the bondholders, and the Stone & Webster interests.

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Edmonton Sale in Prospect—Negotiations are under way for the purchase of the Edmonton Municipal Street Railway System in Edmonton, Alberta. C. J. Yorath, president Canadian Utilities, Ltd., of Calgary, Alberta, has offered the Edmonton City Council $3,500,000 for the street railway and the munici light and power systems. His compa would add to the power resources of city by an additional development augment the equipment of the railw Payment would be spread over a per of twenty years and the city of Edm ton would be required to create a fu for payment of debentures on munici utilities outstanding on Dec. 31, 19 This amounts to approximately 234,701.

Foreclosure Suit Against Bris Line—A bill in equity was filed in United States District Court at Phi delphia on April 19 by the Union Tr Company, of Maryland, trustee for foreclosure of a mortgage on property the Trenton, Bristol & Philadelp Street Railway, Bristol, Pa. This mo gage covers the outstanding 30-y bonds, amounting to $544,500 on wh no interest has been paid since 19 The default in interest amounts $108,900.

New Director in Oakland—Fra Lloyd, purchasing agent Key Syst Transit Company, Oakland, Cal., h been elected to the board of direct to fill the vacancy caused by the res nation of C. P. Murdock. Mr. Llo has been connected with the Key Sy tem for twenty years.

Oklahoma Railway Acquisitions—T Interstate Commerce Commission h authorized the Oklahoma Railway acquire control by lease of the Oklahon City Junction Railway, a 6-mile lin and permitted to acquire control of t 5-mile Oklahoma Belt Railway to pu chase of capital stock and by lease.

Decrease in Net for March Quart in Providence—Totaling $644,549, t gross operating revenue of the Unite Electric Railways, Providence, R. for March, showed a decrease of 2. per cent, compared with the precedin month. Net earnings for the mont amounted to $41,435, after deduction interest and all other charges. Th was a decrease of 13.83 per cent, comparison with net earnings for Marc 1928. For the quarter ended March 3 the company showed gross earnings $1,867,712, a decrease of 4.77 per cen compared with a similar period las year. Net earnings, after all charge amounted to $96,543, a decrease of 42.9 per cent over the March quarter in 192

Deposit Time Extended for Michiga Railroad Issue—Notice has been issue to holders of Michigan Railroad firs mortgage five-year 6 per cent gold bond due on May 1, 1924, that the bond holders' protective committee for thi issue, comprising Allen G. Hoyt, Stan ley A. Russell and William W. Bride will receive deposits under the agree ment dated Oct. 23, 1924, until May 1 next. Holders failing to deposit thei bonds on or before that date will no be entitled to become parties to th agreement or to share in the benefit thereof, and will acquire no right thereunder. The Bay City-Flint division of the Michigan Railroad is reported sold to two Saginaw scrap-metal dealers The sale included 47 miles of track, al overhead wires and 39 interurban cars.

Spokane Railways Sells Park—Natatorium Park, amusement park of Spokane, has been sold by the Spokane United Railways to Louis B. Vogel concessionaire. The reported price is $100,000.

Conspectus of Indexes for April, 1929

Compiled for Publication in Electric Railway Journal by

ALBERT S. RICHEY
Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last 5 Years High	Last 5 Years Low
Street Railway Fares* 1913 = 4.84	April 1929 **7.75**	March 1929 **7.75**	April 1928 **7.61**	April 1929 **7.75**	Jan. 1924 **6.91**
Electric Railway Materials* 1913 = 100	April 1929 **145.0**	March 1929 **144.8**	April 1928 **140.0**	March 1924 **163.9**	Feb. 1928 **139.5**
Electric Railway Wages* 1913 = 100	April 1929 **230.1**	March 1929 **230.1**	April 1928 **228.8**	April 1929 **230.1**	Jan. 1924 **217.4**
Am. Elec. Ry. Assn. Construction Cost (Elec. Ry.) 1913 = 100	April 1929 **200.9**	March 1929 **203.4**	April 1928 **202.2**	March 1924 **206.8**	Sept. 1927 **199.4**
Eng. News-Record Construction Cost (General) 1913 = 100	April 1929 **203.4**	March 1929 **207.8**	April 1928 **206.4**	March 1924 **224.7**	Nov. 1927 **202.0**
U.S. Bur. Lab. Stat. Wholesale Commodities 1926 = 100	March 1929 **97.5**	Feb. 1929 **96.7**	March 1928 **96.0**	Nov. 1925 **104.5**	April 1927 **93.7**
Bradstreet Wholesale Commodities 1913 = 9.21	April 1929 **12.90**	March 1929 **13.00**	April 1928 **13.42**	Dec. 1925 **14.41**	July 1924 **12.23**
U. S. Bur. Lab. Stat. Retail Food 1913 = 100	March 1929 **153.0**	Feb. 1929 **154.4**	March 1928 **151.4**	Nov. 1925 **167.1**	May 1924 **141.0**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	March 1929 **159.8**	Feb. 1929 **161.0**	March 1928 **161.1**	Nov. 1925 **171.8**	March 1929 **159.8**
Industrial Activity Elec. World—Kw.-hr. used 1923-25 = 100	March 1929 **13[illegible].7**	Feb. 1929 **140.4**	March 1928 **118.2**	Feb. 1929 **140.4**	July 1924 **73.4**
Bank Clearings Outside N. Y. City 1926 = 100	March 1929 **103.9**	Feb. 1929 **110.1**	March 1928 **101.6**	Feb. 1929 **110.1**	May 1924 **84.4**
Business Failures Number Liabilities (Millions)	March 1929 1703 **35.44**	Feb. 1929 1720 **62.26**	March 1928 2001 **53.20**	Jan. 1924 2231 **122.95**	Sept. 1928 1348 **23.13**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Personal Items

E. R. Heiny Promoted

IN RECOGNITION of his successful handling of a number of difficult problems in the rehabilitation of the Lincoln Traction Company, Lincoln, Neb., after it had been taken over by Nebraska units of the United Light & Power Company, E. R. Heiny, general superintendent, has been promoted to the position of vice-president and general manager. Mr. Heiny is thoroughly trained on both the technical and executive sides of the work of supplying street car service.

He was graduated in 1908 from the University of Pennsylvania as an electrical engineer, and immediately entered the service of the Philadelphia Rapid Transit Company, being a member of its engineering corps for four years. From there he went west into the service of the McKinley interests, operators of a number of interurban lines out of St. Louis, becoming, during his nine years of service there, division superintendent of the Illinois Traction Company, a member of the McKinley group. In 1918 he was made superintendent of transportation for the Lincoln Traction Company, then locally owned. Later he became general superintendent, and has been in charge of the operating end ever since it was divorced from other utility service and centered activities on transportation.

E. R. Heiny

Mr. Heiny has been able not only to restore the company to popular favor, but also has been diligent in effecting a working agreement with the regulatory authorities that has gained willing co-operation in eliminating unnecessary car lines, and in developing supplementary bus service. Eight bus lines giving better service, earning larger gross revenues, and costing less to operate have so far been established. His efforts at co-ordinating service while keeping it satisfactory is reflected in a constantly increasing surplus.

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Changes on South Shore Lines

R. H. James, was recently elected vice-president of the South Shore Lines. He will have direction of all traffic matters, including rates and divisions. Mr. James joined the Commonwealth Edison Company in May, 1925, and was appointed to the president's office, a position he still holds.

In December, 1925, under instructions from Samuel Insull, he organized and was appointed executive in charge of the traffic bureau, and at the same time was also appointed vice-chairman of the executive traffic committee.

In June, 1928, he joined the Chicago, South Shore & South Bend Railroad as assistant to the chairman, and in March, 1929, was elected a vice-president of that railroad.

In March, 1929, he was elected a vice-president of the Chicago, Aurora & Elgin Railroad, and in April, 1929, a vice-president of the Chicago, North Shore & Milwaukee Railroad.

Three changes were put in effect on April 1 by Charles H. Jones, general manager.

William H. Ragsdale, formerly general shop foreman, became master mechanic.

Merle Aldrich, formerly electrical engineer, became engineering assistant to master mechanic.

Charles F. Ludden, formerly assistant to Mr. Aldrich, became acting electrical engineer.

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Changes in West Penn

Paul M. Mase, formerly assistant general auditor with the West Penn Electric Company, has been made controller of the Monongahela West Penn Public Service Company and subsidiary companies, with headquarters at Fairmont, W. Va. His first West Penn connection was with the Pittsburgh, McKeesport & Greensburg Street Railway in 1904 in the capacity of clerk and from 1906 to 1910, inclusive, he was cashier at Oakford Park. For nearly twenty years he has held various responsible positions in the accounting department of the Pittsburgh office, culminating in his promotion to controller of "Monongahela West Penn." Mr. Mase was born in Greensburg, Pa., and received his early education there, later attending Ohio State University for three years.

Due to Mr. Mase's promotion, a number of advancements and changes has been made in the accounting department. A. W. Evans, auditor of disbursements, assumes jurisdiction of the distribution and payroll work in addition to his present duties, and reports to M. W. Glover, general auditor. Mr. Evans has been with the company since Nov. 1, 1921, being employed from then until March 1, 1923, as chief clerk in the disbursement department. On the latter date he became auditor of disbursements.

Prior to becoming affiliated with the West Penn organization, Mr. Evans spent ten years with the Midvale Steel & Ordnance Company as chief cost accountant, two years in the army as first lieutenant with the ordnance department, and two years as resident auditor for the General Electric Company at the plant of the Allegheny Steel Company in Brackenridge.

George W. Buchanan is appointed to the position of assistant auditor of disbursements. He was formerly distribution auditor in Cuba and Mexico for The Foundation Company of New York City.

Other changes affect the duties of F. S. Diebold, who in addition to work orders has been put in charge of payrolls and construction, and those of R. C. Oswald, who is now chief clerk in charge of distribution and vouchers.

◆

Honor for G. W. Van Derzee

G. W. Van Derzee, vice-president and assistant general manager of The Milwaukee Electric Railway & Light Company, was unanimously elected president of the Wisconsin Utilities Association, Milwaukee, Wis.

His first work with The Milwaukee Electric Railway & Light Company was in power sales and he shortly became assistant to S. B. Way, then vice-president. A while after Mr. Way became president of the company, Mr. Van Derzee was made vice-president and assistant general manager, in which position he continues.

After graduating from the University of Wisconsin in 1908, Mr. Van Derzee spent some time in graduate work and on the instruction staff at the Houghton School of Mines, after which he entered the shops and later sales forces of the General Electric Company in Milwaukee.

G. W. Van Derzee

He has been active in the commercial and public relations work of his company. In his present position, he has general supervision over the advertising, commercial, rate, accounting, purchasing and stores, and publicity departments and for years has been president of the company Employes' Mutual Savings and Building and Loan Association.

Mr. Van Derzee has had much to do with arranging the programs for some of the later conventions of the Wisconsin Electrical Association and more recently has been actively interested in the National Electric Light Association and the Association of Edison Illuminating Companies.

◆

Milton R. Stahl, an attorney of St. Louis, Mo., has been appointed by Governor Henry S. Caulfield of Missouri to the chairmanship of the Missouri Public Service Commission. His term as commissioner will expire on April 15, 1935. He succeeds Dudley Calfee, of Jefferson City, as a member of the board and replaces Almon Ing, of Poplar Bluff, as chairman. Mr. Ing is still a member of the board. Mr. Stahl is a graduate of the University of Missouri, class 1916, and studied law at the Washington University Law School in St. Louis. He served abroad during the war and then returned to the law school and graduated in 1920. He is 35 years old.

G. H. Stagg with Niagara Gorge

George H. Stagg has been appointed general passenger agent for the Niagara Gorge Railway, Niagara Falls, N. Y., operating the scenic belt line in the lower Niagara gorge. This appointment was announced by Lee H. Jones, traffic manager of the company, and approved by A. D. Robb, vice-president.

For several years Mr. Stagg has been traveling passenger agent for the Seaboard Air Line at Buffalo. He started his railroad career as a boy at the Elmira office of the Lackawanna Railroad where he spent twelve years, finally being advanced to city ticket agent. In 1901 he resigned to become associated with a Buffalo firm, but in 1905 returned to railroading, accepting the position of city passenger agent for the Erie Railroad in New York City. In 1912 he became associated with the Seaboard Air Line and has held the position of traveling passenger agent for that company until his resignation to become general passenger agent for the Niagara Gorge Railway.

Mr. Stagg was born in Philadelphia.

◆

M. L. Hibbard Succeeds W. R. Putnam at Boise

M. L. Hibbard, for the past year assistant general manager of the Idaho Power Company, Boise, Idaho, has been made vice-president and general manager, succeeding W. R. Putnam, who resigned to join the Electric Bond & Share Company's organization in New York, in which system the Boise property is included.

Mr. Hibbard has had a wide experience in the utility field. Executive positions he has held include that of superintendent of the electric department of the Union Light & Power Company, Fargo, N. D., and later general manager of that company; engineer for the San Antonio Gas & Electric Company and the San Antonio Traction Company, San Antonio, Tex., in charge of engineering and construction of the gas, electric and street railway systems; general manager of the Fargo & Moorhead Street Railway; assistant vice-president in charge of operation, Northern States Power Company, Minneapolis, and later chief operating engineer of that company.

Mr. Hibbard is a graduate of McGill University, Montreal.

◆

Changes in Washington Company

New appointments have recently been announced by George Newell, local manager in Everett of the Puget Sound International Railway & Power Company.

C. C. Coates, general superintendent of Pacific Northwest Traction Company, North Coast Transportation Company and Portland-Seattle Stage Company. T. F. Marsh, assistant general superintendent. E. M. Swift, superintendent of equipment. W. N. Ringrose, assistant treasurer. George Lancaster, purchasing agent.

All of these report to Mr. Newell.

H. R. Leigh, formerly assistant to Col. M. D. Mills, is appointed superintendent of the North Coast Transportation Company and the Portland-Seattle Stage Company. P. T. Lee continues as superintendent of the Pacific Northwest Traction stage lines and is also appointed assistant to H. R. Leigh. L. R. Holt is appointed general foreman of all stage transportation.

Charles H. Clark

Cleveland Men in New Posts

Messrs. Clark and George well known for their outstanding work in engineering fields

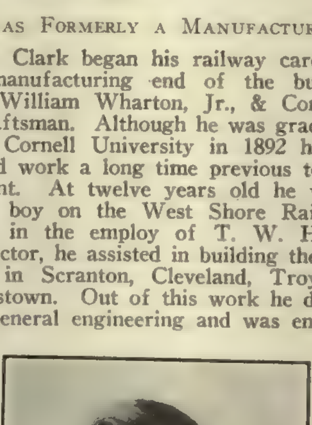
LITTLE need be said to the readers of ELECTRIC RAILWAY JOURNAL in the way of introducing Charles H. Clark and Howard George, who recently stepped into new rôles in Cleveland. Both have a background of electric railway experience in operating and mechanical capacities.

MR. CLARK AT CLEVELAND SINCE 1901

Mr. Clark, who became civil engineer of the Cleveland Railway, on April 1, working directly under President Alexander, first became identified with work in Cleveland in 1901 when he took charge of the track work of the Cleveland Electric Railway. He remained engineer of way until 1907. For about a year he was connected with the International Railway as engineer of way, and later was associated with the Andrews & Stanley interests, first on the New York & North Shore Traction System and later as engineer of maintenance of way Rochester Railway. In 1909 he returned to the Cleveland Railway as chief engineer.

WAS FORMERLY A MANUFACTURER

Mr. Clark began his railway career in the manufacturing end of the business with William Wharton, Jr., & Company as draftsman. Although he was graduated from Cornell University in 1892 he had started work a long time previous to that incident. At twelve years old he was a water boy on the West Shore Railroad. Later in the employ of T. W. Harris, contractor, he assisted in building the railways in Scranton, Cleveland, Troy and Norristown. Out of this work he drifted into general engineering and was engaged
in the work of helping to build the Tre
Falls dam. From this work he bec
identified with the Utica & Mohawk
ley Railway and had charge of the
struction of that line for the Andre
Stanley syndicate. For these same inter
he went to Cleveland in 1901.



Howard George

MR. GEORGE BEGAN HIS CAREER I
NEW JERSEY

Mr. George, who gives up the title
superintendent of research for supe
tendent of way, was well known as
sistant chief engineer of the Public S
ice Production Company in Newark, N
prior to his becoming superinten
of research for the Cleveland Railway
year. He began his career in the rail
industry in 1906 with the Public Ser
Railway. There he remained until J
1925, serving successively as field engin
division engineer, assistant to chief e
neer and engineer of maintenance of
It was in the latter-mentioned year
he was transferred to the Public Ser
Production Company, the construction
sidiary of the Public Service Corporat
Mr. George has been very active in Am
can Electric Railway Association w
particularly in the Engineering Associat
From 1923 to 1928 he served as chair
of the committee on way and structu
He has represented the American Elec
Railway Association sectional commi
on tie specifications of the American e
neering standards committee, and also
on specifications for special trackw
materials.

Mr. George is a graduate in civil e
neering of the University of Pennsylva
class of 1907.

◆

William C. Edwards has assumed
directorship of the Texas Public Serv
Information Bureau and the editors
of the bureau news bulletin. The
few years Mr. Edwards has spent
Washington, D. C., and Atlanta, Ga.
the April 15 issue of the *Public Ser*
News. Mr. Edwards states the purp
of the bureau is not only to furnish
public with accurate information rega
ing public utilities but also to contrib
to the upbuilding of Texas.

J. N. Shannahan, president of
Omaha & Council Bluffs Street Railw
and chairman of the advisory council of
American Electric Railway Associati
has been chosen to head the commit
for the celebration of the 75th anniv
sary of the admission of Nebraska to
United States as a territory. Appoi
ment to this civic committee is a
flection of the high esteem and pub
confidence which Mr. Shannahan
won in Omaha and Nebraska in his
years as head of the utility.

H. L. Engelhardt was recently p
moted to the newly-created position
safety engineer in charge of the saf
division, a new division authorized
the California Railroad Commission.
Engelhardt, who assumes this rôle
May 1, has had many years' experien
in safety work and during his two yea
employment with the commission
devoted his entire efforts to that cl
of work. He will be assisted in his n
duties by three safety inspectors, W.
Lemon, H. C. Lemon and A.
Meininger. This new division will
vestigate serious accidents and "will e
able the commission to serve the pub
even more adequately than before in t
important respect."

Messrs. Nicholl and La Monte in New Rôles

As a farewell to Thomas H. Nicholl who resigned as superintendent of motive power of the Union Traction Company of Indiana on April 1, his associates expressed their appreciation of his services in the form of a banquet held at the Hotel Stilwell in Anderson, Ind. Mr. Nicholl has accepted a position with the Cleveland Railway in the research department.

From September, 1914, to 1916, he was engaged as light and power solicitor with the Traction Light & Power Company, Anderson, Ind. In May, 1917, during the World War, Mr. Nicholl entered the First Army Officers Training Camp at Fort Benjamin Harrison. Upon completion of this training course he received a commission as Captain of the Tenth United States Infantry, where he served through the duration of the war. His first position upon leaving the army was with Ball Brothers, Muncie. He next was employed as manager of the Komo Chemical Company, Kokomo, where he remained until his resignation in August, 1922, to accept a position as acting superintendent of motive power with the Union Traction Company of Indiana, in which capacity he has been engaged until his recent appointment in Cleveland. During the past year or two Mr. Nicholl has been active in the Central Electric Master Mechanics Association, being its first president and now chairman of the standardization committee and a member of the handbook committee of that organization.

Mr. Nicholl was born at Baltimore, Md., on Dec. 11, 1893. He received his education at the University of Michigan.

Mr. Nicholl was succeeded by Heber La Monte, purchasing agent for the past three years. He will retain this position in addition to his new duties with headquarters at Anderson. Mr. LaMonte's first railroad work was with the Erie Railroad in May, 1911, when he was employed as yard clerk, chief yard clerk and assistant yardmaster at Huntington, Ind. In January, 1913, he was promoted to general yardmaster, which position he occupied for several years. He then left railroad service and was engaged in various official capacities with the Anderson Rubber Works until the fall of 1923. From 1923 to 1926 he was in the advertising and brokerage business out of Chicago. His first electric railway service began in 1926, as purchasing agent with the Union Traction Company of Indiana, which work has culminated in his present appointment to superintendent of motive power. Mr. La Monte was born on April 30, 1891, at Huntington, Ind. After graduating from the Huntington High School in 1908, he attended the University of Indiana for three years.

◆

William E. Wood, of Richmond, president Virginia Electric & Power Company, who has been on a brief pleasure trip to Europe, has landed in New York from the Lloyd Sabaudo liner "Conte Grande." Mr. Wood remained in New York for a few days on business for the Virginia Electric & Power Company before continuing on to Richmond. Mr. Wood sailed on the "Berengaria" on March 8 from New York and spent most of the time in Germany and Spain. He took the steamer at Gibraltar on April 8.

J. P. Potter, vice-president Key System Transit Company, San Francisco, Cal., was recently elected vice-president of the Pacific Railway Club for the coming year.

Curtis L. Hill

Messrs. Hill and Lamb Will Give Tacoma Best Service

An ambitious program has been laid out by Curtis L. Hill, new manager of the Tacoma Railway & Power Company, Tacoma, Wash. In outlining the new policies of the company and its associated companies, the Tacoma Bus Company and Pacific Traction Company, Mr. Hill announced that the bondholders plan an aggressive business policy involving the expenditure of $366,000 for track and equipment improvements. He invited constructive criticism of the service saying that the problem was an engineering one and not a political problem and that he wanted all to consider the Tacoma Railway & Power Company a Tacoma institution.

Mr. Hill, a native of Tacoma, was educated in engineering at the University of Washington, served overseas in the air service, and has engaged in private engineering practice since the war. He has been affiliated with the Puget Sound Power & Light Company and the Tacoma Railway & Power Company since 1920, having served in the power department during that period.

L. L. Lamb, who becomes general superintendent of the railway, has been with the Tacoma Railway & Power Company since 1911 in various capacities connected with the maintenance of railway equipment. He has a wide experience in this kind of work.

The remaining members of the reorganized personnel were mentioned previously in Electric Railway Journal News. Change in the control of the system to the hands of Richard T. Sullivan, Tacoma representative of the bondholders, was effective April 1. The Stone & Webster control had extended over the past 27 years.

L. L. Lamb

This change, by which direction of the company is lodged with local Tacoma interests, was foreshadowed some weeks ago by Scott Z. Henderson, receiver for the Puget Sound Electric Railway, former operator of the Tacoma-Seattle interurban and owner of the stock and second mortgage bonds of the Tacoma Railway & Power Company. Under the plan Mr. Sullivan remains in executive control instead of general manager of the system. The change involves the Pacific Traction and Tacoma Bus Companies as well as the Tacoma Railway & Power Company.

◆

Homer Loring

Homer Loring, whose election to the board of directors of the Boston Elevated Railway, Boston, Mass., was mentioned previously, has always elicited the eternal "how" for his singular achievements in restoration and rehabilitation. He first came into the limelight some years ago when, as State Administrator for the Commonwealth, he instituted several polices of economy in the state service. Later he took over the control and rehabilitation work of the Eastern Massachusetts Street Railway, then known as the Bay State Street Railway, and when he left that position he was elected to the board of directors of the Boston & Maine Railroad. He became its chairman and was instrumental in bringing about the financial reorganization of the company, the reconstruction of its terminal facilities and the building of the new North Station. His latest work has been in connection with the restoration of the textile industry.

On the directorate of the Boston Elevated Railway there may not be very much to do unless the relation of the road to the Commonwealth changes, for the company is under public control, managed by a Board of Trustees.

All other directors were re-elected at the April 1 meeting.

◆

A. LeRoy Hodges in Massachusetts

Public trustees of the Eastern Massachusetts Street Railway are confident that A. LeRoy Hodges will bring to the Brockton district an enthusiasm and a background of valuable experience. His appointment as manager of the Brockton District, effective on April 9, was mentioned in the Electric Railway Journal News.

For several years Mr. Hodges was assistant general manager and a director of the Brooklyn City Railroad, a system with 230 miles of lines and operating 1,300 cars. During his connection with the Brooklyn company the road was completely rehabilitated, and the entire rolling stock modernized.

Mr. Hodges began his street railway career with the Westchester, Kennett & Wilmington Railway, Kennett Square, Pa., as secretary to the general manager. In 1908 he was secretary to the assistant general manager of the switch board department of the General Electric Company at Schenectady, and in 1911 became secretary to Vice-President and General Manager A. W. McLimont, of the Michigan United Railways, Jackson, Mich. When this property was leased to the Commonwealth Power, Railway & Light Company, he was appointed chief clerk to C. E. Morgan, general superintendent Michigan Railway, and continued in that capacity at Jackson and Grand Rapids until he went with the

Brooklyn City Railroad in October, 1919, under Mr. Morgan.

Since the promotion of A. J. Boardman, former Brockton manager, to be vice-president and acting general manager, the public trustees have had under consideration numerous street railway operating men, in various parts of the country, for the Brockton management.

C. W. Squier in New Post

Clarence W. Squier, formerly of the staff of ELECTRIC RAILWAY JOURNAL, has assumed his new duties as associate editor of *Mechanical Engineering*, published by the A.S.M.E.

Not a theorist alone, but a practitioner, Mr. Squier is also a correctionist whenever and wherever he is brought face to face with needed transit improvements and developments. Testimony of this fact is seen in his four years' activity with the General Electric Company as designer of control apparatus, and in the capacity of designing engineer with the Sprague Electric Company when that company was pioneering in multiple-unit control apparatus. This intensive experience was to be extended across the Atlantic in 1904. At the Pittsburgh Works of the Westinghouse Company he followed the testing and equipping of the first 35 electric locomotives for the New York, New Haven & Hartford electrification.

In 1908, with a background of high spots in practical equipment work, Mr. Squier went to Brooklyn, where he was an important factor in the preliminary work looking toward the unification of the Brooklyn Rapid Transit System. After the dual rapid transit contracts were signed, Mr. Squier was appointed assistant statistical engineer for the Public Service Commission for the First District, State of New York. It was these duties he relinquished in 1918 to become associate editor of ELECTRIC RAILWAY JOURNAL, which saw, and later found in him, a valuable link in the chain of theoretical and practical transit development.

David V. S. Maxwell, retiring president of the Schnectady Rapid Transit, Inc., Schnectady, N. Y., has been made superintendent of bus operations, following the purchase of that company by the Schenectady Railway. Other officers, who will continue with the new owners, are Olin T. Randall, secretary, and Ernest H. James, treasurer. Until a survey of the bus operations in Schenectady and vicinity is made, the same policies will govern the continued operation as prevailed at the time of the purchase.

Julius Klein, director of the United States Bureau of Foreign and Domestic Commerce since 1921, has been appointed Assistant Secretary of Commerce by President Hoover. Mr. Klein is a Californian by birth and a recognized authority on commercial and trade matters. He is a regular contributor to periodicals on the subject of foreign trade and on economic and commercial problems.

J. D. Barnhart, for the last eleven years superintendent of shops of the electrified lines of the Illinois Terminal Railroad at Decatur, Ill., is now in charge of the shops of the former Illinois Terminal Company, at Federal, Ill., a suburb of Alton, his territory and jurisdiction having been extended to include that plant. Mr. Barnhart joined the Illinois Traction System as master mechanic at Granite City and two years later became superintendent of shops in Decatur. His latest advancement puts him in charge of car shops of both the steam and electric lines of the system.

A. Balfour Brehman has been elected president of the Union Traction Company, Philadelphia, operated under lease by the Philadelphia Rapid Transit Company. He succeeds the late Jeremiah Sullivan. At the special meeting of the board a new office of chairman of the board of directors was created, to which Arthur V. Morton, vice-president of the Pennsylvania Company for Insurance on Lives, was elected. An executive commitee of the board was also formed, composed of Edward M. Story, chairman; Joseph Gilfillan, Arthur V. Morton, John H. Mason, Sr., and John J. Sullivan. Officers of the company are ex-officio members of the committee.

John Leisenring has been appointed assistant to the chief engineer of the Illinois Terminal Railroad System, Springfield, Ill. One important duty will be supervision over problems involved in the operation of the railroad properties of the company including direct power supply facilities.

OBITUARY

William Gillies Ross

The life of the late William Gillies Ross, president and managing director of the Asbestos Corporation, Ltd., director and executive of many important industries and companies in Canada, and one of the best-known street railway experts in America, was crowded with successful effort in many phases of Dominion activity. A skilled economist and an astute financier, he played an important part in the reorganization and development of many Canadian enterprises.

Born in Montreal on Aug. 6, 1863, he was educated at the Montreal High School and in 1880 entered commercial life as a chartered accountant. Eight years later he associated himself with the late James Ross in the electrification of the railways in Winnipeg, Toronto, Montreal and St. John, and the organization of electric railways in Jamaica and Mexico City. He was named comptroller of the Montreal Street Railway in 1896, and assumed the managing directorate of that company and of the Montreal Park & Island Railway in 1904, retaining these two posts until 1910 when he entered the asbestos business. During these years he had also become second vice-president of the Montreal Light, Heat & Power Company; director of the Dominion Iron & Steel Company; president of the Quebec Railway, Light & Power Company; and president of the Canadian Street Railway Association. He served as president of the Street Railway Accountants Association of America in 1904, and in 1910 as vice-president of the American Street Railway Association. In this latter post he was the first Canadian so to serve. Mr. Ross founded and was first president of the Montreal Street Railway Mutual Benefit Society, an organization devoted to the relief and care of the electric railway's employees.

His war work, particularly his organization of the Navy League in Canada and his founding in the Dominion of the British sailors' relief fund, was recognized by His Majesty the King, who awarded him th Special Service decoration in appreciatio of efforts on his part which resulted more than $3,000,000 being obtained to a the widows and children of British ar Canadian seamen who had been killed du ing the war.

As an accountant and economist Mr. Ro had few equals in the Dominion. Whe experts from the United States and Gre Britain needed aid in their efforts to solv the intricate task of rearranging the a counting of the Dominion Iron & Ste Company and of the Dominion Coal Company, he, in a short time, helped material by suggesting the installation of metho which are still in use by these corporation In every company which he directed, reorganized the systems of accounting. H was frequently consulted by leaders industry on accounting and financial problems.

At the time of his death, Mr. Ross wa president and general manager of the Asbestos Corporation Limited; vice-preside and director of the Amherst Park Lan Company; director of the Canadian Gener Electric Company, Ltd., and director the Fire Insurance Company of Canada.

P. W. Ellis, chairman Toronto Transportation Commission, Toronto, Ont died in that city on April 22. He wa a pioneer in the movement which resulted in the province acquiring a hydro-electric system of its own, and wa interested in a score of public and pr vate enterprises. He was the first president of the Canadian Manufacturers Association, and had served as vice chairman and treasurer of the Ontari Power Commission and as a member the first hydro-electric power commission. The Toronto *Globe* stated that was his strong zeal for public ownership showing itself in early life that enlisted the time, talents and energy Mr. Ellis in the service of the people If it were in the public interest n sacrifice was too great for him to make He had made a thorough study of labo questions which proved of value to him in the discharge of his duties. He wa 71 years old.

William J. Curtin, former genera counsel for the Eighth and the Ninth Avenues Railways in New York and fo the Brooklyn-Manhattan Transit Corporation, is dead. Mr. Curtin was born in Buffalo 59 years ago. He attende the Buffalo Law School and became a assistant district attorney in that city later coming to New York.

Andrew F. Daley, for 22 years genera foreman of construction for the Rockford Electric Company, operating th railway system in Rockford, Ill., die April 19. He was born in Baldwinsville N. Y., 64 years ago.

Franklin D. Jones, lawyer and author died recently. He was a recognize authority on trade associations and wa prominently identified with several o them. His book on trade associatio activities and the law was recognized a the standard authority in the trade association field, while his historical development of the law of business competitio is considered the most thorough an scholarly treatment of that subject i print.

C. H. Bartels, for 25 years employe by the East St. Louis & Suburban Railway, East St. Louis, Ill., first in th claims department and later as a specia agent, died recently.

Spring Construction Programs Getting Under Way

WHILE purchases of electrical material and wire for transmission and other purposes undoubtedly have been held up during the past few weeks due to the fluctuating prices of copper, the purchase of track material has gone forward and a number of noteworthy projects have gotten under way with the coming of better weather.

It is announced that the Milwaukee Electric Railway & Light Company will spend more than $1,000,000 in renewing and extending its street railway trackage during the year, including an extension of double tracks which will add nearly 2 miles to the company's system. The program is coordinated with municipal street paving plans so that the entire width of certain streets will be improved simultaneously. In addition, costly special work is to be replaced at a number of important intersections.

Virginia Electric & Power Company, Richmond, Va., launched its spring and summer program with the reconstruction of 6,000 ft. of single track on its Q Street line, preparatory to paving the thoroughfare with 6,000 yards of vitrified brick. The project, which will cost $60,000, is part of a $250,000 improvement outlay set for completion during 1929. The company has recently purchased 1,200 International steel twin ties for T-rail. The Bethlehem Steel Company is supplying one carload of rail tieplates, 660 tons, 7 in., sec. 407-A rail and 160 tons, 80 lb. A.S.C.E. T-rail.

City to Repave Tracks in Seattle and Reconstruct Elevated

The city purchasing agent, Seattle, Wash., has received a low bid of $28,304 from the Bethlehem Steel Company for three solid manganese, special track layouts and 1,100 tons of rail for the municipal street railway lines. An ordinance appropriating $28,000 from city funds has been prepared to cover the cost of paving the municipal street railway's share of the street improvement on Second Avenue North and to do the necessary track reconstruction. The City Council has also passed a bill appropriating $140,000 for the reconstruction of the elevated railway structure on West Spokane Street and East Marginal Way.

The Cleveland Railway has started a $200,000 track extension program in the Cleveland Heights district. When completed the fare in Cleveland Heights will be increased in accordance with a franchise adopted last December. Approval has been given for the purchase of brake shoes to the value of $55,000 from the Railway Material Company; 40,000 creosoted, red oak ties from Republic Creosoting Company, $70,000; and weatherproof copper cable from the American Electrical Works, $6,500.

Engineers of the Capital Traction Company, Washington, D. C., are planning to install new rail and paving on Connecticut Avenue, a distance of 3,116 ft., and on Pennsylvania Avenue from 9th to 15th Streets. The Connecticut Avenue work is estimated at $28,000 and that on Pennsylvania Avenue at $38,000.

Allegheny Valley Street Railway, Pittsburgh, Pa., has received 370 tons of 70-lb. T-rail, to be used for rebuilding the line between Aspinwall and Cheswick.

Construction of about 4 miles of street railway track in Vancouver, B. C., is promised by W. G. Murrin, vice-president British Columbia Electric Railway, in a statement discussing the question of raising the fares from 6 to 7 cents. Various other major track extensions are also under consideration.

For sundry maintenance and improvement work the Chicago Surface Lines has recently purchased 250 tons of 7-in. rail, 100,000 lb. hook-head spikes, 13,500 welding plates, 15,000 tierods, 178,000 lb. trackbolts, 54,000 lb. welding rods, 2,120 switch ties and 130 crossing ties. Line material purchased includes 1,800 wood strain insulators, 3,500 insulated bolts, 100 quick-break switches, 9,375 split pole sleeves, and 75,000 ft. soft-drawn span wire.

Track reconstruction under way and contemplated on the lines of the Duluth Street Railway, Duluth, Minn., has necessitated the purchase of 10,000 tamarack ties, 2,400 white oak ties, 2,000 tieplates, 120 kegs of spikes and 20 kegs screw spikes. Orders have also been placed for 500 gross tons 5-in. Illinois section 8040, 25 gross tons 7-in. Lorain Steel Company section 93/507 and 18 gross tons 7-in. Lorain Steel Company section 114/480 steel rails, as well as 5 miles No. 00 trolley wire.

An extensive program of track construction and reconstruction is indicated by the purchase by the Toronto Transportation Commission, Toronto, Ont., of 1,200 gross tons 122-lb. section L.S. 122-491 grooved-girder rail, 50 gross tons 140-lb. section L.S. 140-468 girder-guard rail, 50 gross tons 114-lb. section L.S. 114-480 girder-guard rail, 11,000 standard trackbolts, 25,000 combination flat tieplates, 10,000 track spikes, 3,000 7-in. rail bonds, type AW-8, 750 pairs 26-in. six-hole standard splice bars and 600 pairs 122-lb. welding splice bars. This is in addition to seven complete special trackwork layouts and 400,000 granite paving blocks.

Exhibitograph No. 9

MANUFACTURERS!

A.E.R.A. Exhibit Committee

Reports

52,308 sq.ft. of space

asked for at the

ATLANTIC CITY CONVENTION

in ONE week

after space applications had been mailed.

If you are going to exhibit this year

Better File Your Application Before May 13

Only 102,489 sq.ft. available

BIGGEST AND BEST CONVENTION EVER.

The Connecticut Company, New Haven, Conn., has ordered 1,600 tierods, 800 kegs track spikes, 1,035 gross tons of rails, 550 pair joint plates, 379 kegs trackbolts and 2,000 steel ties.

A program of track improvement and reconstruction undertaken by the Twin City Rapid Transit Company, Minneapolis, Minn., has necessitated the purchase of a quantity of material, including 700 gross tons 5-in., 80-lb. T-rail, section 8040, 800 gross tons 6-in., 100-lb. T-rail, section 10020 (both orders filled by Illinois Steel Company) 400 kegs railroad spikes, 8,000 white oak ties, 5,000 cedar ties, 33,600 vitrified paving brick, and 6,600 bbl. Portland cement. Two single-track branch-offs and five standard 75-ft. radius switches were supplied by the Lorain Steel Company. Line material purchased included 133,000 ft. $\frac{5}{16}$-in. seven-strand, double perfected galvanized wire, and 70,000 ft. $\frac{1}{4}$-in. wire from Jenney, Semple, Hill & Company. For work on car repair and remodeling there were ordered 1,500 34-in. steel car wheels and 150 steel billets from Illinois Steel Company, 25,000 ft. Southern white oak and 12,000 ft. No. 3 common oak lumber from various dealers, 200,000 gal. asphalt road oil were ordered from Standard Oil Company, and 30,000 gal. viscoline lubricant from Phillips Petroleum Company. New road building machinery purchased includes one No. 7 Rex concrete mixer, a No. 818 all-steel Universal crusher, and a $\frac{5}{8}$-cu.yd. shovel, supplied by the Motor Power Equipment Company and powered with a 25-hp. General Electric motor.

Lehigh Valley Transit Company Buys Track Machinery

Purchases of the Lehigh Valley Transit Company, Allentown, Pa., include 4,000 white oak ties, and a number of special track appliances, including two No. 8 BP L.G. electric grinders from the Chicago Pneumatic Tool Company, one Eccentric rail grinder No. 138 and one Sansom rail grinder No. 704 from the Verona Tool Works, and one Atlas rail grinder from the Railway Trackwork Company.

While no extensive improvements are planned, the Pittsburgh Railways, Pittsburgh, Pa., has made liberal purchases of track, overhead line and shop material for maintenance and repair. In the first category are listed 50 kegs of various size boat spikes, 100 kegs trackbolts, 50 kegs of machine bolts, 620 railroad crossing bolts and 2,580 ties. Line work projected has called for the purchase of 30 tubular-steel poles from the National Tube Company, 50 crossarm supports from the Electric Railway Improvement Company, 500 W216151 and 1,000 W268588 straight-line feeder insulators and 500 W256162 corner insulators from the Westinghouse Electric & Manufacturing Company. A quantity of sectional insulators, trolley guard and crossings was supplied by the Ohio Brass Company.

Washington Railway & Electric Company, Washington, D. C., has purchased six No. 158 pneumatic diggers and three CC-45 paving breakers from the Ingersoll Rand Company.

In addition to the experimental cars mentioned elsewhere, the Louisville Railway has also recently placed orders for 300 tons 7-in. A.E.R.E.A., 122-lb. grooved rail, 250 tons standard A.S.C.E., 70-lb. T-rail, 10,000 trackbolts and 6,000 machine bolts. Fifteen miles of No. 00 trolley wire and 5 miles phono-electric wire have also been purchased.

Construction is under way on the extension of the Park Street line in Beaumont, Tex., to the new baseball park.

The Ottawa Electric Railway, Ottawa, Canada, contemplates the purchase of 150 gross tons of 122-lb. grooved rail. This company has recently purchased a quantity of track spikes and trackbolts, mainly from Canadian manufacturers.

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Rolling Stock Orders Numerous

Altoona & Logan Valley Electric Railway has placed an order with the Osgood-Bradley Car Company, Worcester, Mass., for five cars to cost approximately $18,000 each. Delivery is to be made during July or August. The J. G. Brill Company's Kuhlman plant has received an order for two double-truck, double-end cars for the Newell Bridge & Railway Company, Newell, W. Va. The same company has also recently received orders for 33 single-end motor car bodies and 200 Brill 76-E type trucks from the Chicago Surface Lines, five passenger and smoking motor bodies complete, with Brill 27-MCB type trucks for the Philadelphia & Western Railway, Norristown, Pa., and ten bodies, 42 ft. 1½ in. over-all length, complete with Brill 177-E type trucks, from the Delaware Electric Power Company, Wilmington, Del.

The Nashville Interurban Railway, operating an 18-mile route between Nashville and Franklin, Tenn., announces through its president, Elliott Napier, the purchase for July delivery of two high-speed interurban cars, seating 52 passengers each, from the Cincinnati Car Company.

Purchase of fifteen new cars to cost about $300,000 is planned by the British Columbia Electric Railway.

Completion of its program of remodeling the first group of cars used by the Key System Transit Company, Oakland, Cal., in its transbay service, has been announced by A. J. Lundberg, president. The improvements include the installation of deep-cushioned, individual leather seats; a new seating arrangement, industrial carpet and modern illumination units. Noise-deadening and shock-absorbing shims have been placed between the trucks and the car bodies and about the air compressors.

Gary Railways, Gary, Ind., has placed in service one of two light-weight interurban cars, supplied by the Cummings Car & Coach Company.

Orders have been placed by the Cleveland Railway for five pairs of Timken model 52 car trucks.

That the electric railways continue as the largest group purchasers of buses is indicated by the orders made public during the past month. The Rockford City Traction Company, Rockford, Ill., which already has a fleet of 26 buses, has added two 40-passenger, A.C.F., metropolitan type coaches. Mack-International Motor Truck Corporation reports sale of three model AB, four-cylinder, 25-passenger, city-type buses to the Illinois Power Company, Chicago; and one model AL, 33-passenger, city-type bus to the Houston Electric Company, Houston, Tex.

Twin Coach Corporation has recently delivered four coaches to the Los Angeles Railway, three to the Milwaukee Electric Railway & Light Company, six to the Detroit Motorbus Company, all of the urban type, and five suburban-express type coaches to the United Railways & Electric Company, Providence, R. I.

United Railways & Electric Company, Providence, R. I., has ordered ten Twin Coaches from the Twin Coach Corporation, Kent, Ohio. The company has also purchased a considerable quantity of material for the usual maintenance work, including 2,000 D-67 brakeshoes and 2,000 D-61 brakeshoes from the American Brake Shoe & Foundry Company.

Orders placed by the Denver Tramway Corporation, Denver, Colo., include an A.C.F. urban type bus, one model 53 White chassis, and one model 54 White chassis, mounted respectively with 25-passenger and 33-passenger Bender, pay-enter, city type bodies.

The Gray Coach lines, a subsidiary of the Toronto Transportation Commission which recently acquired five bus routes from private operators with the approval of the Toronto City Council, is now purchasing 35 new buses for June delivery at a cost of approximately $365,000.

The Twin City Rapid Transit Company also is planning to increase its fleet of buses by the purchase of two 33-passenger, model GY chassis, 239-in. wheelbase buses, complete with bodies, from the C. H. Will Motor Corporation, two 33-passenger, de luxe parlor car bus bodies from Eckland Brothers Company, three four-cylinder, Mack model AB 230-in. wheelbase chassis, and two 29-passenger, all-steel bus bodies from the Lang Body Company, Cleveland.

Other bus sales reported include three A.C.F., 40-passenger, metropolitan type coaches to the Portland Electric Power Company, Portland, Ore., one 21-passenger, Studebaker street car type bus to the Oklahoma Railways, Oklahoma City, Okla.; one A.C.F. de luxe urban coach to the Poughkeepsie & Wappingers Falls Railway, Poughkeepsie, N. Y., fifteen A.C.F., 40-passenger metropolitan coaches to the Detroit Department of Street Railways, and three A.C.F., 30-passenger, urban coaches and two 23-passenger urban coaches to the Scranton Railway, Scranton, Pa. The Altoona & Logan Valley Electric Railway through its subsidiary, the Logan Valley Bus Company, has placed an order for five A.C.F., 23-passenger urban coaches.

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Types of Cut Tacks and Nails Reduced

The Bureau of Standards of the Department of Commerce has published bulletin R47-28 dealing with recommendations for the manufacture of cut tacks and small cut nails, prepared in accordance with the departments' policy of bringing about the elimination of waste through simplified commercial practices. As the result of conferences, held under the auspices of the bureau, the leading manufacturers and users of these materials have tentatively agreed to accept the standards set up in the bulletin. Prior to the adoption of the present list, the possible selection of style, size, finish and packing of tacks and nails comprised 21,200 combinations. The present simplified list has reduced the number to 1,156 stock items. Among other organizations which have agreed to accept the proposed recommendation is the American Electric Railway Association.

High Price of Copper Retards Purchases by Public Utilities

Hand-to-mouth buying, which has bee hailed as one of the great stabilizing influences in American business, seems to b chiefly responsible for the runaway market in copper, consumers of which, along with buyers of nearly every other commodity, had practically discontinued th practice of carrying reserve stocks. Ordinarily, economists agree, this practice contributes importantly to stabilization.

When, in the past, the retailers, the smal users, and jobbers and wholesalers wer forced to carry stocks because transportation was less efficient than now and subject to frequent and unexpected interruptions, a dangerous situation was created With large stocks in the hands of so many persons, statistics were difficult to secur and overproduction of commodities frequently resulted before the situation coul be corrected. Now, with the responsibilit of meeting demand resting principall upon the producer, the danger is greatl minimized, as the producer is in a muc better position to know the relationshi between demand and supply. In the cas of copper, however, this practice playe into the hands of those who are anxiou to attain more influence in that industry The consumers would have been in muc better position to protect themselves in thi instance had more adequate statistics bee available.

The recent great increase in the pric of copper is regarded as an unhealth boom, since in it were the elements of combination of increased demand by th consumer and a disposition by the producer to exact the greatest toll out of temporary shortage. As a result, worl trade in that commodity has been disorganized and difficulties have been passe down into all the ramifications of tha important business. That the consumer are not without redress is instanced by th recent recessions in the price of this meta

◆

Louisville Railway Receives Experimental Cars

The second of four different types o cars, which have been ordered by th Louisville Railway, Louisville, Ky., fo trial purposes on its lines, was recentl placed in service. The first of the ne cars, supplied by the St. Louis Car Company, was delivered some weeks ago an was favorably received by the public. seats 51 passengers in individual leather upholstered seats, arranged in pairs, an is provided with other modern convenience The second car to arrive was supplied b the Kuhlman plant of the J. G. Brill Company. This car has a well entrance an exit, in contrast to the St. Louis car whic had treadle-folding steps. The third ca to be supplied by the Cincinnati Car Co is expected to arrive early in May. Th fourth car will be built in the company own shops, using Timkin trucks an Westinghouse high-speed motors. Sea will be of the semi-individual, leather upholstered type. The two cars alread received are similar in seating arrangemen ceilings are low and the front dash ha adopted features of bus construction.

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O. M. Edwards Company, Syracus N. Y., is to equip the 100 new cars bein supplied to the city of Detroit, Depar ment of Street Railways, by the Perle A. Thomas Car Works, with brass sas together with necessary sash fixtures.

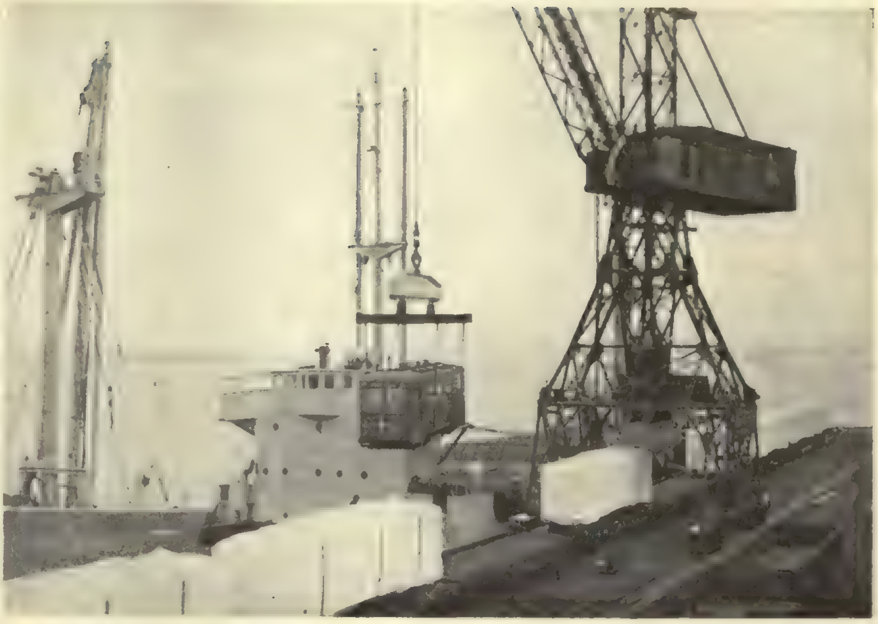
J. G. Brill Company Ships Cars to South America

As an evidence of the expanding aracter of American foreign trade hich has extended to all branches of dustry, there were recently shipped om Eddystone ten of an order of venty trolley cars completed by the G. Brill Company at its Philadelphia ant for the Companhia Carris Porto legrense, of Porto Alegre, Brazil. The rs were completely assembled down the last detail for shipment. This said to be the first occasion that a reign shipment has not been made sections or unassembled. An accom- nying photograph shows one of the rs being loaded aboard the Norwegian eighter, "Belpamela," from the pier at ddystone.

The new cars are the first of the so- lled "master-unit" type developed by rill. A complete account of the rea- ns for developing the line and gen- al specifications of the various models, ere given in an article by George Frey iblished in this paper for Jan. 26, 1929. he car body is of the light-weight pe, arranged for double-end, one-man two-man operation. Sides are single- veep curved, with skirt below the sill. latforms are drawn in and the ends ive sloping window sash, somewhat ter the manner of the latest types of is construction. A well at each step is two two-leaf folding doors at each orner of the platform for entrance and cit. Seats are of the reversible type, holstered in rattan. "Admor" seats mahogany are provided at diagonal ght-hand corners, bringing the total seating capacity up to 44. A pedestal seat, with spiral spring and cushion, is provided for the operator.

Underframe is of steel throughout, and copper bearing steel is used wherever needed to resist corrosion. The door mechanism is arranged to interlock with brakes. The motorman, or one-man operator, controls the doors at both ends of the right side of the car through a selector valve, and both ends of the left side through a double-control valve. The conductor is to operate the doors on each side of the platform at the rear through a control valve attached to a stand located at the center of the end sills, cross-wise of the car.

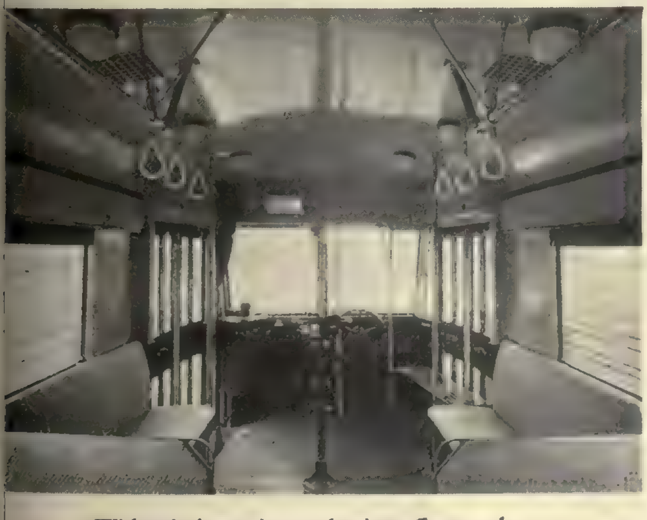
No scale weights of the cars are



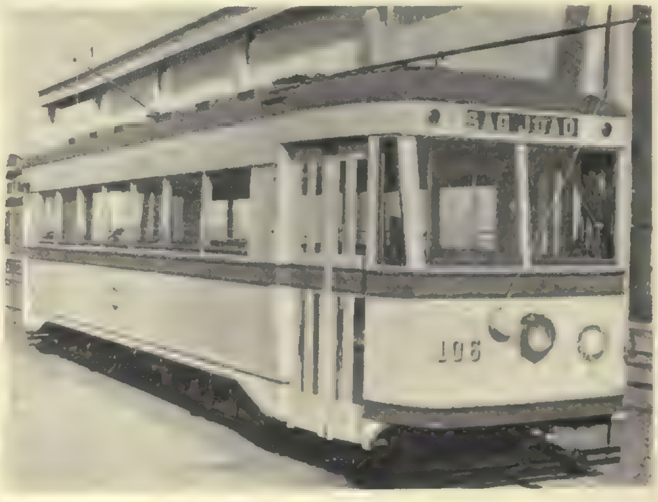
Loading new Porto Alegre cars on the Norwegian freighter "Belpamela" at Eddystone, Pa.

SUMMARIZED SPECIFICATIONS OF CARS SHIPPED TO BRAZILIAN ELECTRIC RAILWAY

ıme of Railway	Companhia Carris Porto Alegrense, Porto Alegre, Brazil
ımber of units	20
ʏpe of unit	One-man or Two-man, Motor Passenger, City, Double end, Double truck
ımber of seats	44
ate of order	Dec. 31, 1928
ate of delivery	April 1, 1929
olster centers	17 ft. 5 in.
ngth over all	38 ft. 1 in.
ngth over body posts	27 ft. 5 in.
uck wheelbase	5 ft. 4 in.
idth over all	8 ft. 5¼ in.
ight, rail to trolley base	10 ft. 6¾ in.
indow post spacing	3 ft. 5 in.
ody	Semi-steel
oof	Arch
oors	Folding, end
r brakes	General Electric
Axles	A.S.T.M. specifications
Car signal system	Buzzer, Faraday single stroke bell
Compressors	CP—27—B
Conduit	Duraduct and Duratube
Control	Safety Car, type K
Couplers	Brill radial drawbars
Curtain fixtures	Curtain Supply Company
Curtain material	Pantasote No. 86
Destination signs	Hunter, type 226-RB
Door mechanism	National Pneumatic Company
Fare boxes	Cleveland model 5
Floor covering	Yellow pine and Tuco Flexolith
Glass	Libby-Owns
Hand brakes	Peacock staffless
Hand rail and stanchions	Monel metal
Headlights	Crouse-Hinds
Headlining	Agasote, ¼ in.
Interior trim	Mahogany window sills, enameled steel posts and fittings
Journal bearings	Plain
Journal boxes	MCB, 3¾ x 6 in.
Lamp fixtures	Electric Service Supplies Co.
Motors	Four G.E.-265, inside hung
Roof material	Cypress, canvas covered
Safety car devices	Standard
Sash fixtures	Curtain Supply Company
Seats	Brill No. 201-E Phoenix type
Seat spacing	31 in.
Seating material	Rattan, leather faced
Slack adjusters	Brill mechanical
Steps	Stationary
Step treads	Kass
Trolley catchers	Keystone
Trucks	Brill No. 177-EX-1
Ventilators	Brill exhaust
Wheels	Steel tired, 27 in. diameter
Wheelguards	H-B
Windshield wiper	Brill single blade



Wide windows give a pleasing effect to the car interior



Streamline painting in bright colors creates an attractive exterior

available. The estimated weight for all-steel cars of this type is given as 34,635 lb.

Porto Alegre, the point to which the cars are destined, is a city of about 100,000 population, containing large foreign elements, mainly German and Italian. It is the capital city and principal port of the Brazilian State of Rio Grande do Sul.

◆

Single-Phase Railway System Reviewed

Development of the single-phase system for railway propulsion is the subject of an attractive special publication of the Westinghouse Electric & Manufacturing Company, known as Reprint 357. The history of the system is taken up from its inception. That history is, according to the authors, J. V. Dobson and F. C. Hanker, closely interwoven with the engineering activities of the late B. G. Lamme. Early experiments culminating in the equipment of the New York, New Haven & Hartford Railroad are considered in some detail. Following this are short sections on the Norfolk & Western, the Virginian, and the Pennsylvania Railroad installations. Brief mention is made of the motor-generator locomotives, such as are used on the Detroit & Ironton and the Great Northern systems.

At the end of the publication is a complete list of railways throughout the world using single-phase systems, with detailed statistics on the locomotives of all types employed on them.

◆

Copperweld to Be Sold by General Cable

General Cable Corporation has consumated an agency agreement with Copperweld Steel Company, whereby General Cable Corporation is appointed the sole and exclusive agent in the United States to draw wire from Copperweld rods and to sell wire so drawn and wire products made therefrom.

Copperweld Steel Company has recently enlarged its special equipment for the production of Copperweld billets and rods and General Cable Corporation has, in its several plants, large capacity for the drawing of these rods into wire and for the fabrication of wire products. These complementary facilities, together with the engineering, sales and distribution organizations of both companies, will be effective to secure increased production and distribution of Copperweld wire and wire products, together with improved service to all users of Copperweld material.

Hereafter all copper-covered steel wire and wire products handled by General Cable Corporation will be produced exclusively from Copperweld material.

Full and complete sales and engineering service on Copperweld wire and wire products is now available through each of the divisions of General Cable Corporation.

◆

Steel Companies Merge

Merger of the Commonwealth Steel Company, Granite City, Ill., with the General Steel Casting Company, Philadelphia, Pa., brings the American Steel Foundries, Baldwin and American Locomotive Corporations into a new combine, since General Steel Castings Company has recently been organized by those three concerns. J. P. Morgan & Company, New York, is handling the financing and has been designated as the depository for the stocks in the merger.

The Commonwealth Steel Company recently announced a $1,000,000 program of additions to its Granite City plant. This plant occupies about 80 acres with 170 acres of additional industrial property held by the company in the immediate vicinity,
giving ample room for expansion.
plant is equipped with six large op
hearth furnaces, having a capacity of 1
000 tons annually, used chiefly in the ma
facture of steam railroad locomotive b
gas-electric rail car beds, Pullman
trucks and parts.

This company manufactures street
interurban and trailer trucks for the el
tric railway industry and has truck
stallations on the Philadelphia Ra
Transit Company, Pacific Electric, Det
Street Railway, Interborough Ra
Transit Company and other large prop
ties.

TRADE NOTES

Ross F. Hayes, who during the p
five years has been engaged as manuf
turers' agent, railroad supplies, at N
York, has become connected with
Adams & Westlake Company as rep
sentative in charge of Eastern sales
Rex car specialties. Hr. Hayes was f
merly for many years with the Curt
Supply Company as Eastern manager
New York, and later was general sal
manager at Chicago. The Curtain S
ply Company was consolidated ab
two years ago with the Adams & We
lake Company. Mr. Hayes goes to
Adams & Westlake Company at
Eastern office, 50 Church Street, N
York.

General Electric Company, Schen
tady, N. Y., has received orders for
first quarter of 1929 amounting to $1
365,208, compared with $79,925,840
the corresponding period of last ye
an increase of 27 per cent.

The White Company, Clevela
Ohio, announces the promotion
Thomas Blagden, Jr., Australian di
sion manager, to vice-president of
export region. L. M. Hart, managi
director of The White Company, L
has been appointed vice-president
charge of the Canadian territory. Vi
President Jay Rathbun, who has had
entire responsibility of the export a
Eastern regions, will devote his ti
to the Eastern region exclusive
Messrs. Blagden and Rathbun will ha
their offices at 225 Broadway, New Yo

Montain Treating Company, We
boro, Mass., has extended its operati
into the pole-treating field, using its p
ented process of wood preservati
Licenses for the use of this process ha
been negotiated by the Pensacola Cr
soting Company, Inc., Pensacola, F
and the Gulfport Creosoting Compa
Gulfport, Miss. Plans are on foot
utilize a 50-acre site adjacent to
present plant at Westboro, Mass., fo
pole-treatment and storage center
serve New England utilities.

J. C. Lincoln, formerly president
the Lincoln Electric Company, Cle
land, Ohio, has been elected chairm
of the board. J. F. Lincoln has be
elected president. The company ma
a complete line of motors and a
welding devices.

Sullivan Machinery Company, C
cago, Ill., manufacturer of compress
and air-driven machinery, has mov
its general offices from 122 South Mic
gan Avenue to the Wrigley Buildi
400 North Michigan Avenue, Chica
Ill.

ELECTRIC RAILWAY MATERIAL PRICES—APRIL 25, 1929

Metals—New York

Copper, electrolytic, cents per lb	17.775
Lead, cents per lb	7.00
Nickel, cents per lb., ingot	35.
Zinc, cents per lb	6.625
Tin, Straits, cents per lb	44.656
Aluminum, 98 to 99 per cent, cents per lb	24.30
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	54.00
General service	31.50

Bituminous Coal

Smokeless Mine Run, f.o.b. vessel, Hampton Roads, gross tons	$4.10
Somerset mine run, f.o.b. mines, net tons	1.80
Pittsburgh mine run, Pittsburgh, net tons	1.58
Franklin, Ill., screenings, Chicago	1.70
Central, Ill., screenings, Chicago	1.45
Kansas crushed mine run, Kansas City	2.25

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive, $\frac{9}{16}$ in. and larger, cents per lb	2.80
Tie plates (flat type), cents per lb	2.15
Angle bars, cents per lb	2.75
Rail bolts and nuts, cents per lb	3.90
Steel bars, cents per lb	1.925
Ties, white oak, Chicago, 6 in.x8 in.x8 ft	$1.40

Hardware—Pittsburgh

Wire nails, base per keg	$2.70
Sheet iron (24 gage), cents per lb	2.90
Sheet iron, galvanized (24 gage), cents per lb.	3.65
Galvanized barbed wire, cents per lb	3.35
Galvanized wire, ordinary, cents per lb	3.15

Waste—New York

Waste, wool, cents per lb	18.
Waste, cotton (100 lb. bale), cents per lb.:	
White	17.25
Colored	13.5

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb	10.3
White lead in oil (100 lb. keg), cents per lb.	13.25
Turpentine (bbl. lots), per gal	$0.585
Putty, 100 lb. tins, cents per lb	5.725

Wire—New York

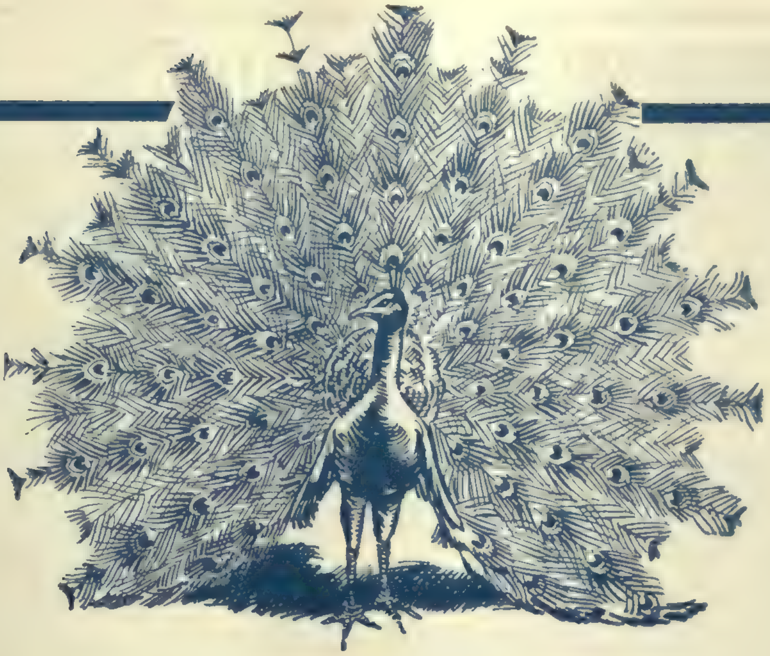
Copper wire, cents per lb	19.875
Rubber-covered wire, No. 14, per 1,000 ft	6.85
Weatherproof wire base, cents per lb	20.875

Paving Materials

Paving stone, granite, 5 in., f.o.b. New York—Grade 1, per thousand	$150
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b,	$2.70
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	51.00
Paving brick 3x8½x4, N. Y., per 1,000 in carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.25
Cement, Chicago consumers' net prices, without bags, f.o.b.	2.05
Gravel, ¾-in., cu.yd., delivered	3.25
Sand, cu.yd., delivered	2.00

Old Metals—New York and Chicago

Heavy copper, cents per lb	13.875
Light copper, cents per lb	11.875
Heavy yellow brass, cents per lb	7.875
Zinc, old scrap, cents per lb	3.585
Lead, cents per lb. (heavy)	5.375
Steel car axles, Chicago, net ton	$17.75
Cast iron car wheels, Chicago, gross ton	14.75
Rails (short), Chicago, gross ton	19.25
Rails (relaying), Chicago, gross ton (65 lb. and heavier)	28.50
Machine turnings, Chicago, gross ton	7.75



Making Assurance Doubly sure!

WITH

PEACOCK STAFFLESS BRAKES

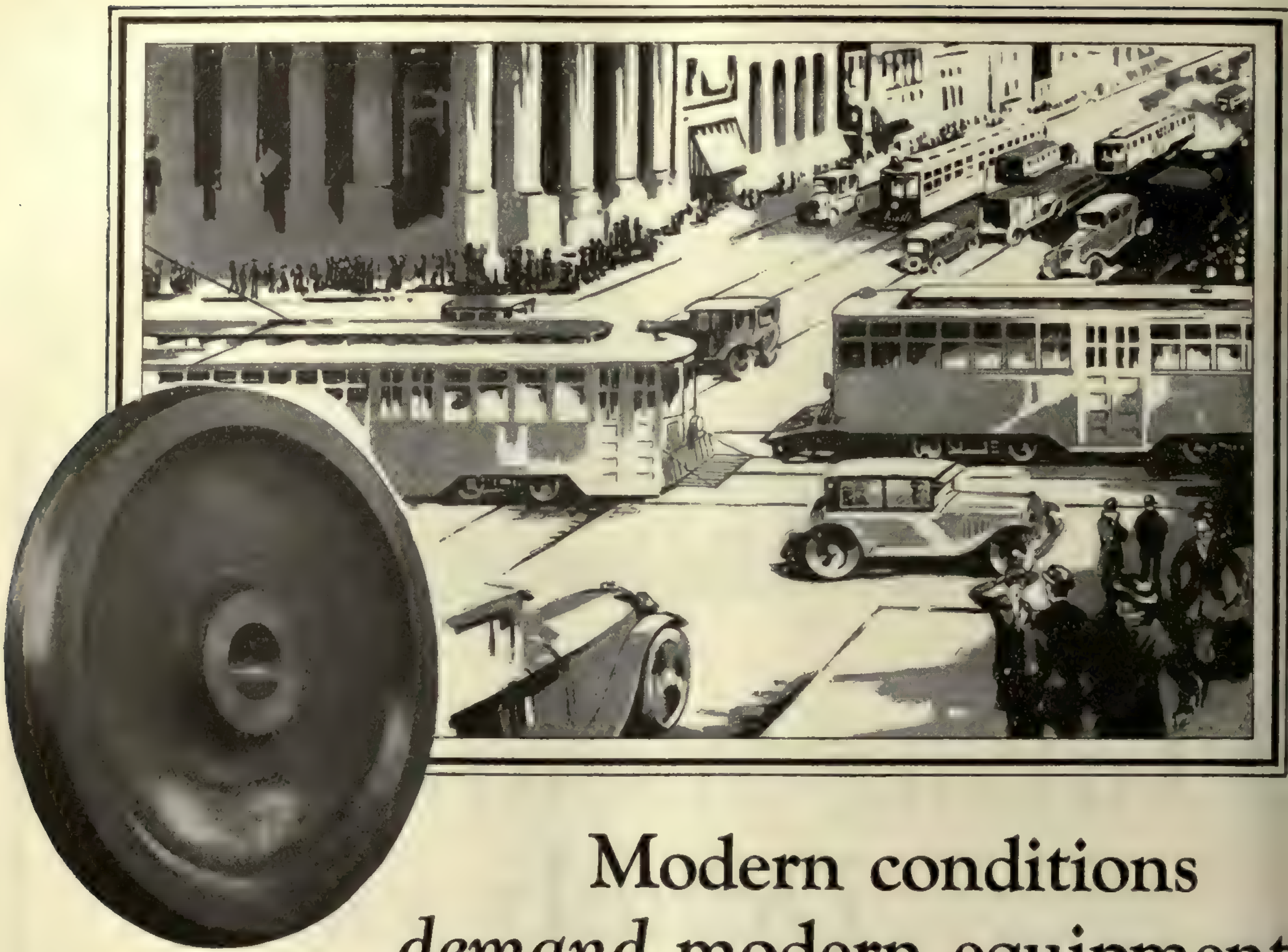
Assurance of brakes that will hold in the emergency—when they are the one thing between disaster and safety.

Safety not only to your cars—to those who ride on them—but to those on the street.

Peacock Staffless Brakes banish all the "bugaboos" that assail you when brakes must stop the car.

National Brake Company, Inc.
890 Ellicott Square, Buffalo, N. Y.
General Sales Office: 50 Church St., New York

Canadian Representative:
Lyman Tube & Supply Co., Ltd., Montreal, Can.



Modern conditions *demand* modern equipment

Traffic conditions today—big cars, heavy loads, accelerated starting and emergency stopping—throw an ever-increasing burden on equipment. Wheels bear the brunt of it all.

Carnegie Wrought Steel Wheels assure high resistance to the wear and tear of modern traffic. Wrought Steel is obtained through forging and rolling. A 10,000 ton hydraulic press (twenty million pounds!) refines the steel—insures a homogeneous structure, free from irregularities that might cause trouble. The rolling process rolls mileage into the steel—mileage to spare. It is this extra mileage that makes Carnegie Wheels such an economical investment.

Before you invest in new wheels, investigate the many advantages of Wrought Steel. A catalogue will be sent at your request. Our wheel engineers are always at your service.

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION
CARNEGIE BUILDING—PITTSBURGH

1882-A

More car-miles per dollar

The Texas Company's refinery in Port Arthur, Texas, where "Texaco Lubricants" are made.

HERE is where Texaco car oils and gear lubricants are made. Much of the country's electric railway equipment is running on Texaco Lubricants, because railway executives have found that Texaco Lubricants substantially cut the costs of operation. They give more car-miles per dollar.

This great Port Arthur refinery of The Texas Company is the source of better lubrication. Selected crudes from the country's oil fields flow into the refinery through thousands of miles of Texaco pipe lines. Scientifically correct crudes are available for every type of lubricant, and only such crudes are used as are perfectly fitted for the production of each specific product. These exceptional crude resources, the exacting laboratory control of every process and the perfection of modern refinery equipment are responsible for the quality of Texaco products.

Texaco Lubricants and Texaco Lubrication Service (the service of engineering specialists in lubrication) are recognized and appreciated the world over. Complete stocks of the same uniformly high quality Texaco Lubricants are available everywhere.

TEXACO LUBRICANTS

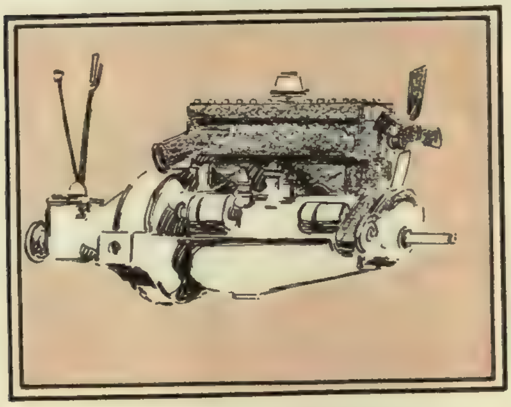
TEXACO

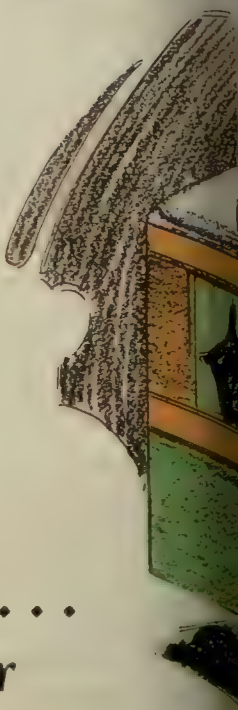
THE TEXAS COMPANY
17 Battery Place,
New York City

Offices in
Principal Cities

THERE IS A TEXACO LUBRICANT FOR EVERY PURPOSE

Longe
Mil





Passenger car lubrication is one problem . . . Motor bus lubrication another

Koolmotor Bus Oils are the result of a fundamental fact, early recognized by Cities Service lubrication engineers. The lubrication problems of the motor bus are distinctly apart from those of any other automotive vehicle on the highways. This fact has always guided our research, which has resulted in the development of Koolmotor Bus Oils.

The rapid increase in use of Koolmotor Bus Oils on so many of the largest motor bus lines in the country reflects the results which they have brought about—greater lubrication efficiency, which has reduced operating costs and increased profits.

You, too, can insure "longer mileage life" by lubricating your vehicles with our recommended grades of Koolmotor Bus Oils.

ge
Life

KOOLMOTOR BUS OILS are carefully refined from 100% Pennsylvania crude for the special requirements of heavy duty, high speed motor bus lubrication. The method used in refining them is based on the findings of the highly trained corps of Cities Service lubrication engineers who are always on the alert to change refining formulas or develop new ones to accommodate everchanging lubrication conditions.

OIL DIVISION
CITIES SERVICE COMPANY
60 WALL STREET, NEW YORK, N. Y.
Koolmotor Products

ANACONDA WIRE *and* CABLE

SELECTED FOR THIS MODEL RAILWAY ELECTRIFICATION ON THE BASIS OF QUALITY AND ENGINEERING SERVICE

IN planning the complete electrification of the Boston, Revere Beach & Lynn Railroad, the management, recognizing its responsibility to the travelling public, spared no engineering effort or cost to provide passenger safety and continuity of service.

An example is the selection of Anaconda Red-Brass Guy Wire for the cross span cable. This alloy was specified because of its high strength and resistance to the corrosive action of salt atmosphere.

The 500,000 C. M. Anaconda Concentric Copper Main Messenger Cable was spliced with Anaconda Seamless Connectors which develop the full strength and conductance of the cable.

The contact wire is Hitenso "A", an Anaconda Cadmium Bronze, and was selected because of its combined high conductivity, high strength and resistance to wear, also because it does not become brittle when overheated as from a short circuit.

An important factor governing the selection of Anaconda Wire and Cable for this project was the technical service given by Anaconda Engineers in helping to solve problems relating to sag, tension, conductivity and other requirements.

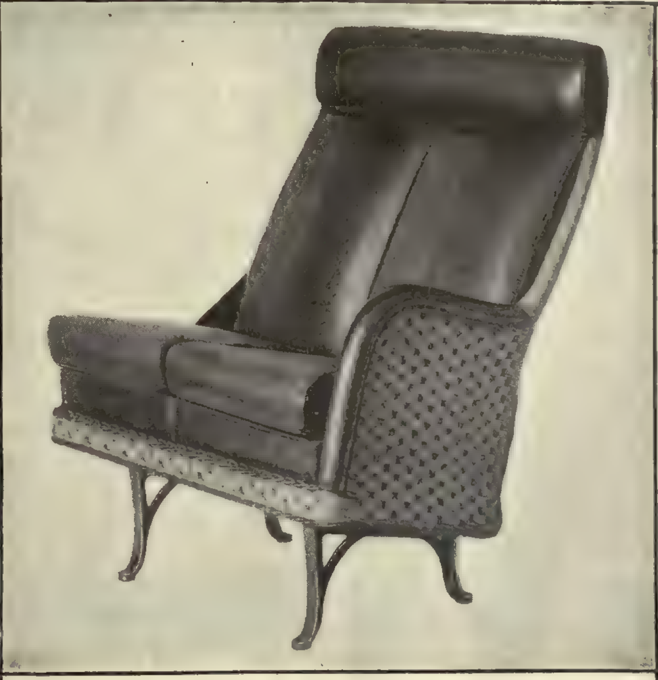
Our Technical and Engineering Departments are always ready to cooperate in any way possible.

ANACONDA COPPER MINING CO.
THE AMERICAN BRASS COMPANY
Rod, Wire and Cable Products
General Offices: 25 Broadway, New York
Chicago Office: 111 West Washington Street

ANACONDA
from mine to consumer

The high conductivity and uniform quality of Anaconda Metals are the result of the co-ordinated control by a single organization which is responsible for every step in their production from mine to finished product.

ANACONDA WIRE PRODUCTS



A Modern Seat in Every Way!

In every possible way this de luxe seat fulfills the requirements of modern bus travel. The 90 P is a smart looking, luxurious style that offers real comfort and relaxation on the long haul. Among its unusual features are the broad roll headrests; the deep, removable comfy spring cushions; and shaped, comfy spring back pads. This style is made with only one armrest to increase comfort and conserve space. This chair may be secured with fibre sides in any desired color. Write to the nearest Heywood-Wakefield sales office for complete details on the 90 P and other popular bus seats in our line.

If you have not received a copy of our new Bus Seat Catalogue, write for it.

HEYWOOD - WAKEFIELD COMPANY

BOSTON, MASSACHUSETTS

516 West 34th St., New York City
J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.
H. G. Cook, Hobart Bldg., San Francisco, Calif.

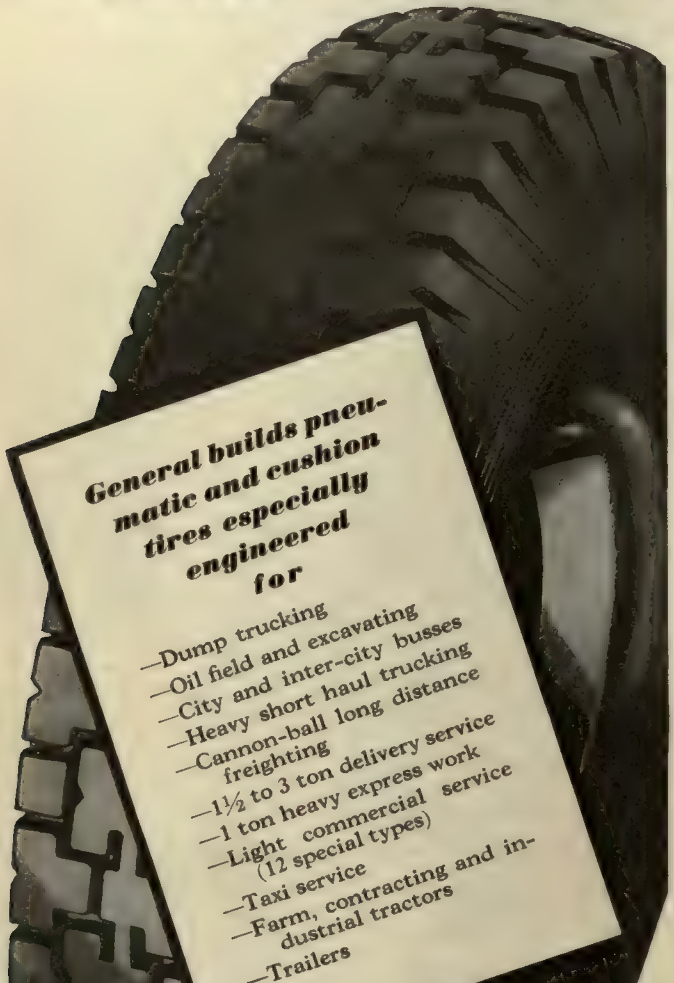
439 Railway Exchange Bldg., Chicago, Ill.
A. W. Arlin, Delta Bldg., Los Angeles, Calif.
The G. F. Cotter Supply Co., Houston, Texas

The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada

IT'S THE *NON-STOP* MILEAGE THAT MAKES THE BIG HIT

Name Your Tire Problem

—General Will
. . . . Solve It



General builds pneumatic and cushion tires especially engineered for

- —Dump trucking
- —Oil field and excavating
- —City and inter-city busses
- —Heavy short haul trucking
- —Cannon-ball long distance freighting
- —1½ to 3 ton delivery service
- —1 ton heavy express work
- —Light commercial service (12 special types)
- —Taxi service
- —Farm, contracting and industrial tractors
- —Trailers

The New Dual-Grip Truck Cord

Whatever your particular tire problem may be—whether you operate a single unit or a fleet—the General distributor stands ready to help you solve it.

General maintains a specialized engineering service expressly for looking up and licking the toughest jobs everywhere in truck and bus operation.

There isn't a kind or condition of service that General hasn't tackled and tamed—no demand that is too severe for its transportation experts.

Get in touch with the General distributor. He has a knowledge of tire conditions gained from General's years of leadership in the commercial field. He knows how to fit the right tire to the truck or bus. This is an added assurance of big, continuous low cost mileage. The General Tire and Rubber Company, Akron, Ohio.

The complete General Commercial Line Includes:

Dual-Grip truck cord; Truck and Bus Balloon; the "Jumbo" Ford and Chevrolet line; Heavy Express Special; One-Ton Express Special; Regular Cushion; Demountable Cushion; Heavy Duty Non-Skid Cushion; high-speed and regular; Extra Heavy Non-Skid Cushion; Air Center Cushion, non-skid and rib-tread; High Smooth Cushion.

The
GENERAL TIRE

GOES A LONG WAY TO MAKE FRIENDS

The public has tasted luxur
transportation and likes it. N
ing short of full measure
now satisfy it in public tr
portation. The industry n
meet changed conditions . . .
that quickly . . .

from an editorial in Electric Rai
February 16, 1929.

READ THIS ME

Cincinnati has the designs—Cincinnati has built the most modern cars for years, is building the most modern cars today—cars that are modern in efficiency as well as luxury. And Cincinnati's Survey and Plan Method of selling enables any property to have modern cars at once—and to pay for them out of increased earnings.

We recently submitted a survey and plan to a large property in Indiana. The plan was approved and Cincinnati Cars supplied. Running time on all routes was cut about 8%. The shop organization was cut, creating a saving of $9,000.00 in wages. Power bills were so reduced that a monthly saving of $3,000.00 in power was established (the power rate is 1.1c per K.W.H.) Figures to date indicate an an-

SAGE AGAIN!

nual saving of approximately $85,000.00. As soon as the planned one-man car operation is put into effect a further saving of about $25,000.00 will be made. And these savings tally exactly with our original Survey figures.

The Electric Railway Industry is paying a high price for the continued operation of its obsolete equipment. Some few companies have had the courage to junk old cars, and buy new ones. That courage has paid! Those companies are giving the public what it wants, and the public is responding with increased patronage. Let us lay our cards on the table. The public has tasted luxury in transportation and demands it. We are ready to go ahead. Are you?

NEW ORLEANS

—and a new

How the New Orleans Public Service, Inc., applied Carey Elastite System of Track Insulation to the inside and outside of the rail. Note the new and interesting type of rail construction in connection with girder rail No. 122-491.

Showing granite blocks placed next to the rails, preparatory to placing the asphalt paving.

THE PHILIP CAREY COMPANY

transit discovery

IN 1925, the New Orleans Public
Service, Inc., discovered the new-
day advantages of using Carey
lastite System of Track Insulation
n connection with girder-rail con-
truction. Immediately they made
his transit improvement a definite
art of their extensive betterment
rogram.

Now New Orleans' hundreds of
housands of passengers enjoy
moother, swifter-moving traction
ervice. Now New Orleans' paving
tays in better condition—no vibra-
ion to spread from the track, no
umping and pumping around the
ails. Traction perfection! A saving
n maintenance and a route to faster
chedules.

A view of the finished job, protected by Carey Elastite System of Track Insulation. Observe the smooth appearance of the pavement, between the rails and from rails to curb.

arey Elastite System of
rack Insulation: a durable,
sphaltic compound substantially reen-
rced with pressure-preformed, asphalt-saturated fibre. Used and recommended by street railway officials and public utility organizations throughout the entire United States. Write for full information.

Carey Elastite

REG. U.S. PAT. OFF.

TRADE MARK REGD. U.S. PATENT OFFICE

SYSTEM OF TRACK INSULATION

ockland, CINCINNATI, OHIO

"NATIONAL" SHELBY

SEAMLESS STEEL TROLLEY POLES

Reinforced where reinforcement is needed, without adding superfluous weight or sacrificing resiliency.

THE standard "NATIONAL-SHELBY" Poles are made from 13-gage material, as years of practical experience have shown that a lighter gage may fail by local injuries, and a heavier gage simply adds to the weight of the pole without increasing its strength to a corresponding extent. The theoretical requirement for a pole of minimum weight points out a method for increasing the strength of the pole without a proportionate increase in the weight. This method consists of the use of a reinforcement at the base end, and on the inside of the 13-gage member.

These poles are made by improved methods of manufacture, particularly in the method of inserting the reinforcement. The reinforcement is integral with the body of the pole, which adds materially to its efficiency.

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

SUBSIDIARY OF

UNITED STATES STEEL CORPORATION

Quality Products *Dependable Service*

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Portland Cement Company

Pacific Coast Distributors—United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle, Honolulu. *Export Distributors*—United States Steel Products Company, New York City

WHITE 38-41-passenger *SIX*

IN two years the White Six Bus, Model 54, has set new standards in performance, economy and lasting qualities. It has been a revelation in all things which make a bus desirable to both operator and public.

Now the essential units which gave Model 54 its remarkable success—engine, transmission, rear axle, etc.—have been rearranged in a larger, still stronger chassis, the Model 54-A, especially to meet the demand for a bus with larger seating capacity for city operation.

Model 54-A, 250-inch wheelbase, has ample room for 38 or 41 passengers comfortably seated.

The power plant and driver's seat have been moved forward, considerably lengthening the body space, with only a ten-inch increase in wheelbase. Wider tread front axle gives a short turning radius.

the proven units of the White Six re-combined in a large-capacity bus primarily for city service.

One hundred horsepower delivered at the wheels (with all equipment operating), easy steering; Westinghouse air brakes, clear vision windshield all insure the easy, comfortable handling needed in city service.

It loads fast and moves fast, saving the seconds that count in making rapid city schedules.

Already the Cleveland Railway Company, known among street railways as most careful in buying and most exacting in demands upon equipment, has bought 20 White Model 54-A's.

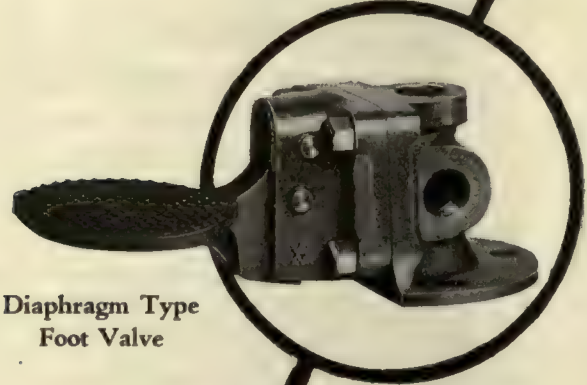
THE WHITE COMPANY, *Cleveland*

WHITE BUSSES

FOURS AND SIXES

We could not improve the Principle . . . So we improved the Details

Diaphragm Type
Cut-Off Valve



Diaphragm Type
Foot Valve

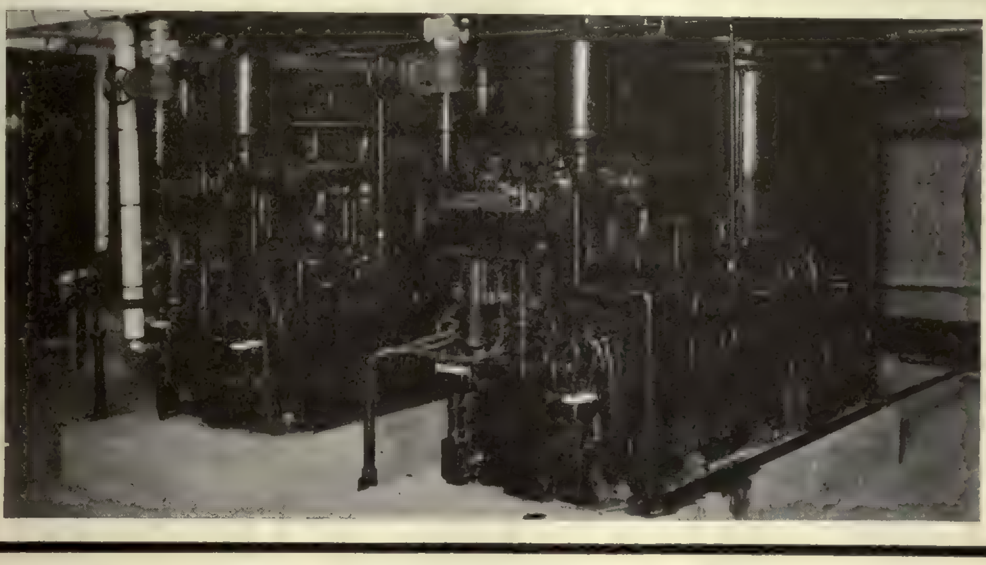
Because the basic idea of interlocking power, brakes, and door control to provide maximum safety and convenience for cars operated by one man was sound in principle it has won universal recognition.

But experience has given us a better understanding of the functional requirements of equipment details, and improvements have been made as needed. To simplify installation and reduce air leakage, a Foot Valve and Cut Off Valve of the "WABCO" Diaphragm Type are now furnished with Safety Car Control Equipments.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK WASHINGTON PITTSBURGH

The Safety Car Control Equipment has been a vital factor in safeguarding accelerated transportation.

Satisfaction that endures



THE quality of Westinghouse National Air Compressors is a warranty of enduring satisfaction.

Quality is the first thought in design, construction and assembly. This strict adherence to high standards has established a reputation for long life, dependability, and economy of operation.

Because of this, many traction properties are now using Westinghouse-National Air Compressors exclusively in their shops, power houses, and maintenance departments. All types and sizes are available, ranging from 3 to 700 cu. ft. displacement—all "Quality Machines for Quality Service."

WESTINGHOUSE–NATIONAL
Air Compressors
"QUALITY MACHINES FOR QUALITY SERVICE"

WESTINGHOUSE TRACTION BRAKE COMPANY
Industrial Division
eneral Office and Works . . . . . . Wilmerding, Pa.

One of the 69 coaches of the Pittsburgh Motor Coach Company, using Goodyear Tires

SAFE TRACTION on the hills of Pittsburgh

Anyone who knows Pittsburgh, Pa., knows that it is far from a normal city for motor coach operation. Up and down steep hills the traffic travels—on grades which would be perilous for passenger-laden coaches equipped with anything less than the surest traction which can be built on a tire.

Recognizing these facts, the Pittsburgh Motor Coach Company equips its 69 coaches with Goodyears—most of them bus balloons.

The famous tractive power of the Goodyear ALL-WEATHER Tread gives new security to brakes. Even when pavements glisten with grease or water, those sturdy, resilient blocks of sharp-edged rubber cut their way through surface film, and grip the solid ground.

Beneath the tread, in the body of the tire, is the extra vitality of SUPERTWIST. This special Goodyear Cord resists fatigue and the strains of frequent braking at the same time that it adds to comfort by its quick-yielding resilience.

Perhaps your operation is not as rigorous in its demands on tires as this one in Pittsburgh. Perhaps it is more so. Whether your need is superior traction and extra resistance to strain—or simply the toughness and vitality to deliver an extremely low cost per mile—Goodyear Truck Tire Service Station Dealers are equipped to provide you with recommendations, expert and accurate, which show the right *tires* for your particular hauling duty.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service, and there are also Goodyear Rubber Tire Chains

GOODYEAR

Copyright 1929, by The Goodyear Tire & Rubber Co., Inc.

That's what the Industry
thinks of the new

Yellow Z 240

Mass Transportation Coach

Syracuse Railway
Coordinated Bus Co.

Buys 3

Public Service
Coordinated
Transport

Buys 254

Montgome
Bus Compa
of Philadelp

Buys 1

Washington
Rapid Transit

Buys 8

Chicago Motor
Coach Company

Buys 30

because

. . . . *conventional* in design - - - - - - and

tern Michigan
Motorbus

Buys 10

Chicago, Milwaukee
& St. Paul R.R.

Buys 2

B. C. Motor
Transportation
Company of
Vancouver, B. C.

Buys 7

O. G. Schultz
Management
Camden, N. J.

Buys 50

Twin City
Motor Bus
Company of
St. Paul

Buys 3

New Orleans
Public Service

Buys 7

Cleveland
Railways

**Buys
5**

built of *proven* units that have been time tested in millions of miles of *heavy duty* coach service—

LORAIN

Girder Rails

◆

Girder Guard Rails

◆

Plain Girder Rails

◆

Rail Joints and
Track Accessories

◆

Expansion Joints
for Electrically
Welded Track

◆

Special Trackwork

Switches, Frogs and Crossings

in

**Solid Manganese Steel,
Manganese Insert Construction,
Chrome Nickel Steel Insert
Construction and Built-up
Construction of all
heights and weights of rail**

The Lorain Steel Company

General Offices: 545 Central Avenue, Johnstown, Pa.

SUBSIDIARY OF

UNITED STATES STEEL CORPORATION

Quality Products *Dependable Service*

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Portland Cement Company

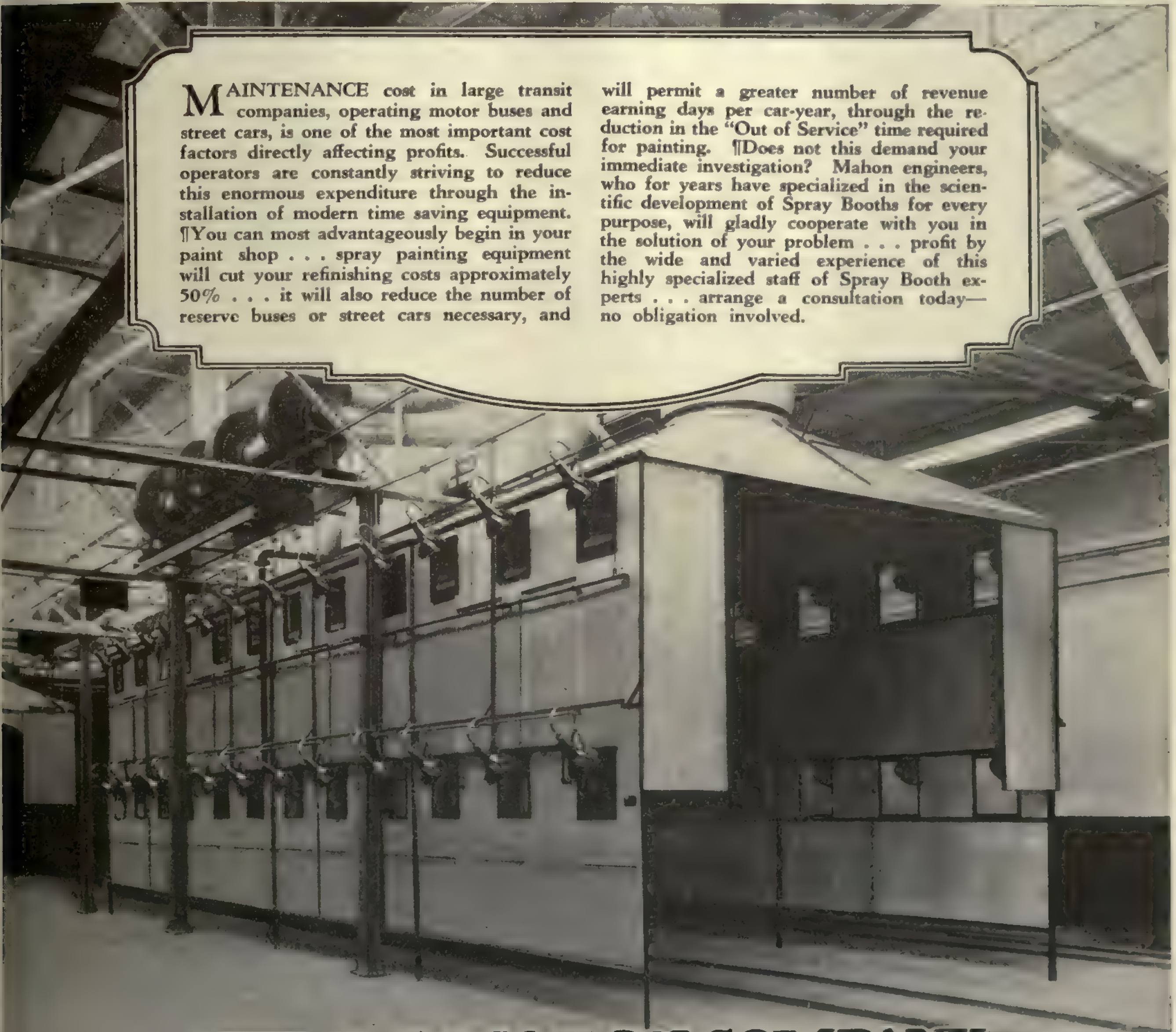
Pacific Coast Distributors—United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle, Honolulu. *Export Distributors*—United States Steel Products Company, New York City

Sales Offices:

ATLANTA CHICAGO CLEVELAND DALLAS NEW YORK PHILADELPHIA PITTSBURGH

Reduce Maintenance Cost ~ ~ Increase Revenue

MAINTENANCE cost in large transit companies, operating motor buses and street cars, is one of the most important cost factors directly affecting profits. Successful operators are constantly striving to reduce this enormous expenditure through the installation of modern time saving equipment. ¶You can most advantageously begin in your paint shop . . . spray painting equipment will cut your refinishing costs approximately 50% . . . it will also reduce the number of reserve buses or street cars necessary, and will permit a greater number of revenue earning days per car-year, through the reduction in the "Out of Service" time required for painting. ¶Does not this demand your immediate investigation? Mahon engineers, who for years have specialized in the scientific development of Spray Booths for every purpose, will gladly cooperate with you in the solution of your problem . . . profit by the wide and varied experience of this highly specialized staff of Spray Booth experts . . . arrange a consultation today—no obligation involved.



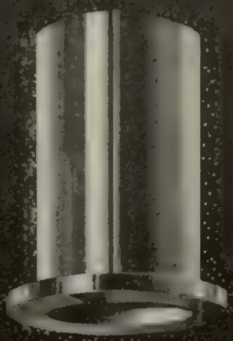
THE R.C.MAHON COMPANY
DETROIT, MICHIGAN

Manufacturers of Spray Booths and Exhaust Stacks, Industrial Drying Ovens and Blow Pipe Systems

MAHON

SPRAY BOOTHS & EXHAUST STACKS
• DESIGNED FOR FIRE SAFETY •

Throughout THE LENGTH AND BREADTH *of Industry*



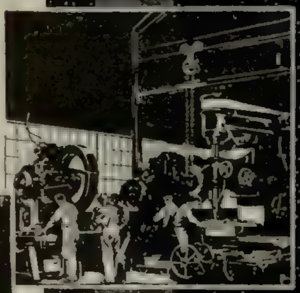
Just when bronze, earliest of the alloys, came into common usage as bearing metal is difficult to determine. It is a known fact, however, that during the past quarter-century more bronze bearings have been made and used than any other kind.

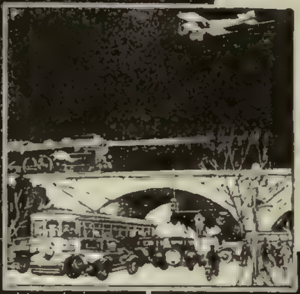
Thruout the length and breadth of industry lives the conviction that for practical utility and economy there is no substitute for bronze bearings.

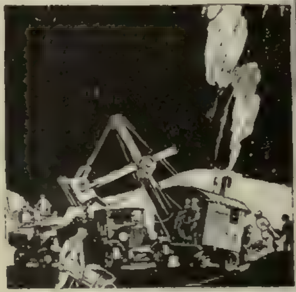
The reasons for this preference are readily apparent. Bronze yields smooth, solid, perfect castings in any size and shape. It possesses qualities of self-lubrication, and thus reduces to a minimum the possibility of scoring and seizing shafts.

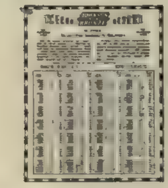
Ideal bronze withstands compression loads under heat, has adequate tensile strength, elastic limits and moderate Brinell hardness. Coefficient of expansion is uniform. Coefficient of friction is low and abrasive elements are absent at all temperatures.

Withal, bronze bearings for most installations cost substantially less per unit and possess out-of-the-ordinary longevity. When replacement is necessary, it is accomplished easily and economically.









Write for a copy of this handy Wall Card which lists over 600 "in stock" sizes ready for immediate delivery.

JOHNSON BRONZE CO.
NEW CASTLE, PA.

JOHNSON BRONZE

BUSHINGS BEARINGS BAR BRONZE

FAGEOL
FAGEOL TRUCKS *are* LONG EQUIPPED
LONG MANUFACTURING CO.
DETROIT — MICH.

LONG

LONG PRODUCTS—AUTOMOTIVE CLUTCHES AND RADIATORS

ANOTHER APPLICATION OF **SKF** BEARINGS ON
THE STREET RAILWAYS OF AMERICA BY THE

Pittsburgh Street Railways Co.

Equipped with the highest priced bearing in the world

YOU MAY BUY A
BEARING AS A
BARGAIN BUT
TRY AND GET A
BARGAIN OUT OF
USING IT

for
Nothing is apt to cost so much
as a bearing that cost so little

SKF
Puts the
Right Bearing
in the
Right Place

Operating Economies Plus Increased Public Favor Make SKF Bearings Paying Investment

THERE'S nothing the matter with this truck now in daily service on the Pittsburgh Street Railways—it just posed for the picture to show that SKF Spherical Bearings were going on the job to keep rolling stock running smoothly and maintenance at a minimum. Thirty such trucks are used on 15 new cars with a total of 120 SKF Bearings.

Much has been said about modernization to increase profits and revive public interest in street railways. That SKF Spherical Bearings are playing an important part in this new trend is based not on generalities but on proven performance. Their inherent self-alignment, freedom from adjustment and long-life have convinced this company after three years' experience that SKF would be the most economical in the long run on these 52 passenger, 49,500 pound cars which often reach a mile a minute speed.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2277

SKF

Ball and Roller Bearings

Provide *for tomorrow's traffic* Today

Bethlehem Silico-Manganese Weldable Crossing at Ralph and Gates Aves., Brooklyn, N. Y., on lines of Brooklyn-Manhattan Transit Co.

Silico-Manganese Special Trackwork

The new Bethlehem Silico-Manganese Special Trackwork is remarkably shock- and wear-resisting. Electric railway companies can install this trackwork at heavy-duty locations with confidence that it will stand up—not only under today's traffic but under the still heavier volume of traffic that tomorrow is certain to bring.

The impact and wear-resisting properties of silico-manganese steel are well-established. It has already been accepted as standard for parts subject to shock and wear, as well as for high grade tools. Silico-Manganese steel of tool steel quality, possessing great tensile strength and tough enough to resist the violent impacts of heavy traffic, is used in the manufacture of this new special trackwork.

Bethlehem Silico-Manganese Trackwork—called Design No. 999—is of one-piece construction. The Silico-Manganese Steel Castings can be readily welded and built up in the field. This welding feature is a decided advantage for quick repair work at heavy traffic intersections.

BETHLEHEM STEEL COMPANY

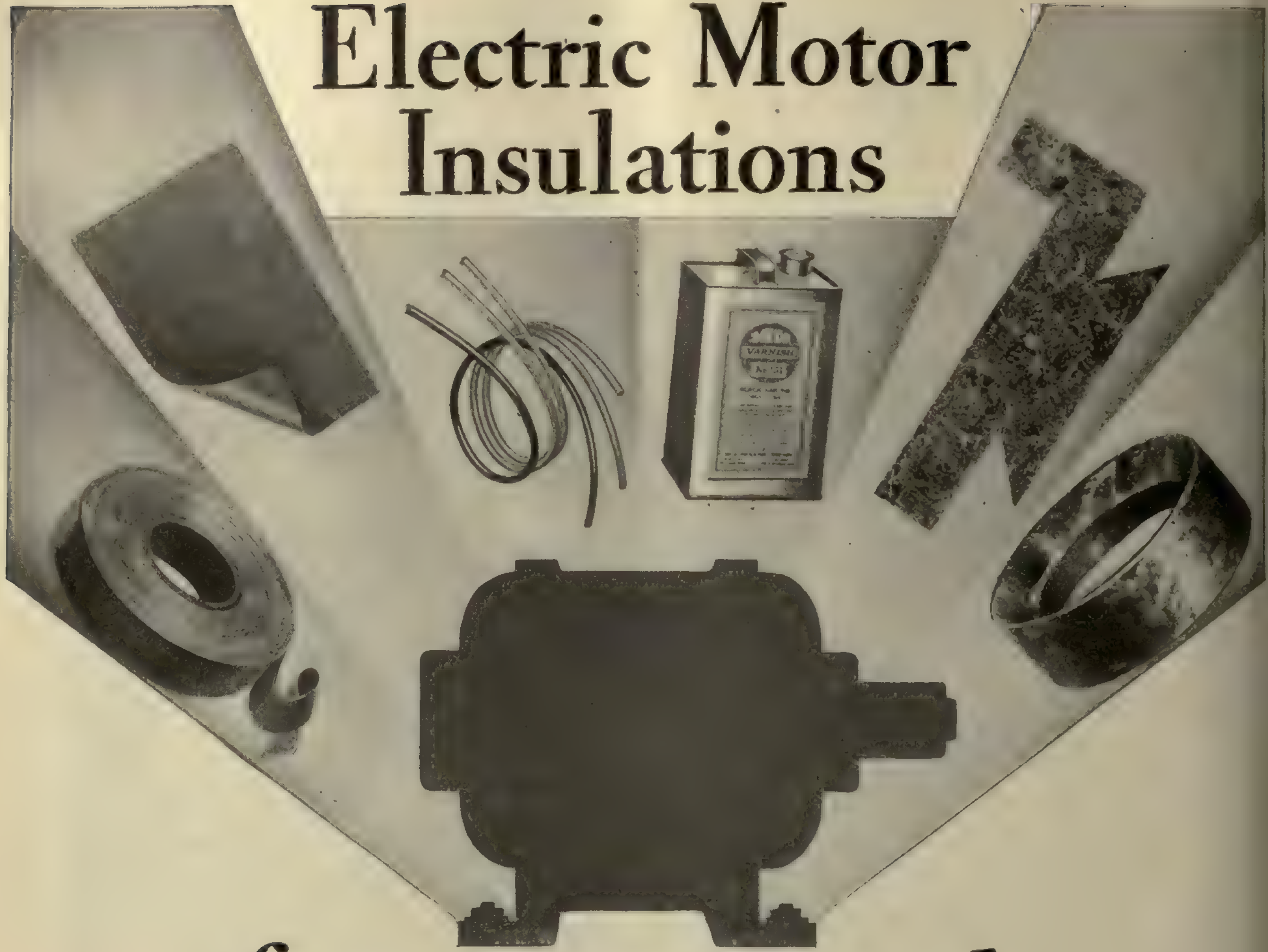
General Offices: Bethlehem, Pa.

DISTRICT OFFICES: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

Bethlehem Steel Export Corporation, 25 Broadway, New York City.
Sole Exporter of our Commercial Products.

BETHLEHEM

Electric Motor Insulations



...for every need

for every motor type and size!

Glance at the insulations listed at the right. There is one for every motor need from slot bottoms to phase leads. They are all performance-proved in thousands of motors of every manufacture. Their quality is unvarying, for throughout manufacture—from raw materials to finished products—continuous inspections to most rigid standards are maintained.

We offer you one source of supply for all your motor insulations and quality that is unexcelled.

MICA INSULATOR COMPANY
New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Works: Schenectady, N. Y. London, England
Cleveland Pittsburgh Cincinnati Birmingham
Seattle San Francisco Los Angeles Toronto Montreal

Super-Micanite and Micanite

Commutator Segments, Commutator Rings, Tape.

Empire Oiled Insulations

Linotape, Cloth, Armatite, Paper, Tubing, Canvas, Duck, Silk.

Mico Insulations

Varnishes, Compounds, Slot Paper, Cotton, Sleeving, Friction Tape, Rubber Tape, Twines.

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

An organization with a long record of achieve

ment in the production of mass transportatio

equipment introduces the last word in the pop

ular full head room, 29 passenger Parlor Coach

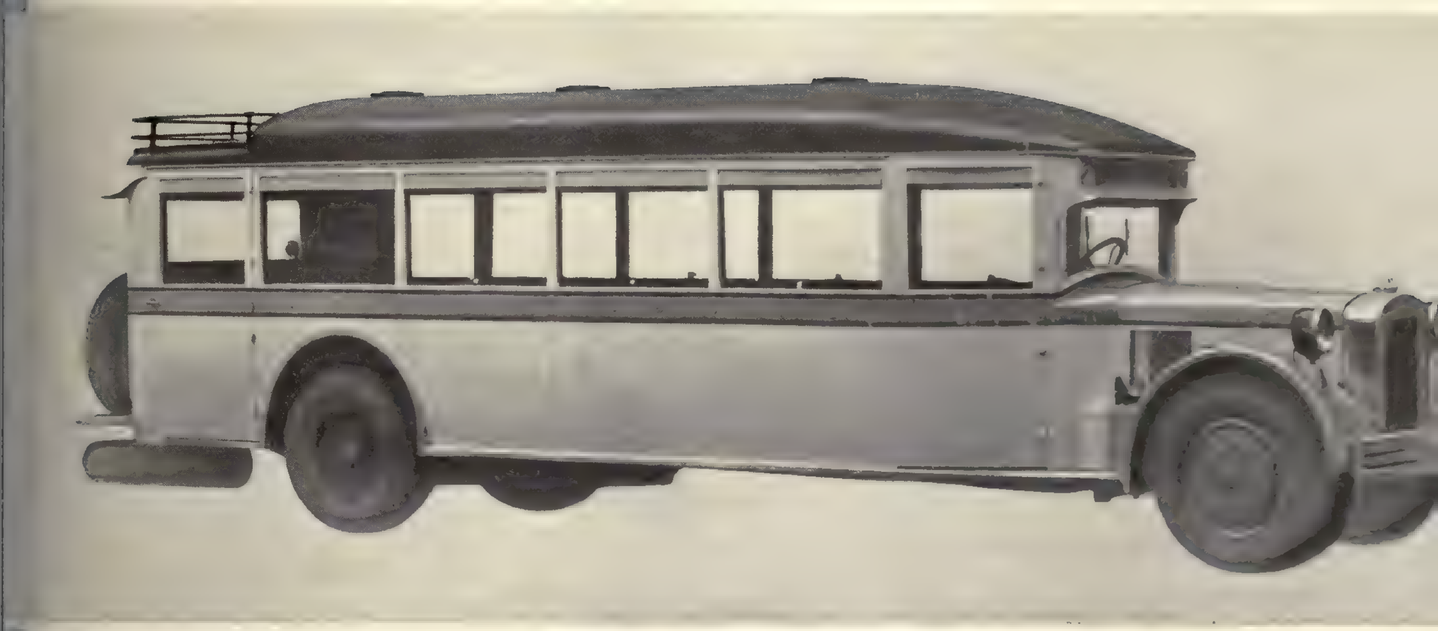
a.c.f

hall-scott

transportation —— *by coach*

The universal mass transportation experience of a c f has never been so perfectly reflected as in the details of the new P12 Full Head Room Parlor Coach for Chassis Model 508-12. Seating comfort for 29 passengers (exclusive of driver), ample leg room, full size interior baggage racks easily accessible, quarter outside baggage rack, adequate head room, window visibility, loading convenience and exterior and interior beauty meet the high transportation standards which have always governed a c f construction. Here is *satisfaction* for every coach operator who strives for the most scientific basis of operation: maximum passenger comfort and maximum revenue space.

See the new P12 for yourself. From the *automotive* standpoint you will find Hall-Scott power, speed, acceleration, strength and lowest weight compatible with endurance and long life. And from the *transportation* standpoint you will see the beauty, convenience and comfort that gets business, and holds it.



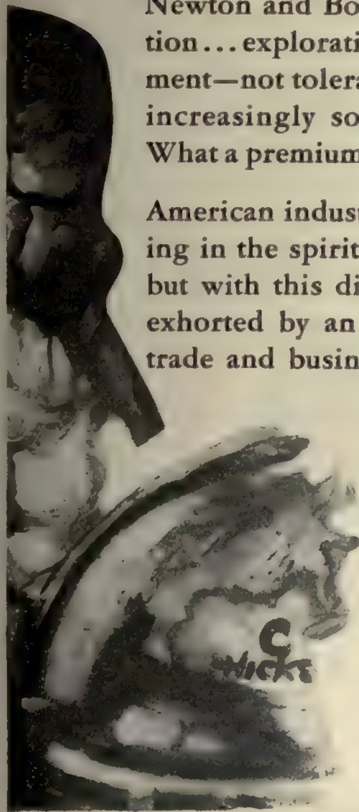
powered by—*hall-sco*

Free of the precedents of both truck and car pract
maintained like transportation power units of
other type—unit assemblies interchangeable—a c
coaches stay on the road while shop work is in progr

When it was a CRIME to Look *Ahead*

McGRAW-HILL

McGRAW-HILL PUBLISHING COMPANY, Inc., New York - Chicago - Philadelphia



"NONSENSE! Stuff and Twaddle!" said Isaac Newton to what 17th Century despots decreed as knowledge.

"Nonsense!" agreed Robert Boyle.

That was heresy . . . and heretics were treated roughly in those days. So the discoverer of the law of gravity and the father of the law of chemical science, aided and abetted by other truth-seeking rebels, formed a blind-pig scientific society. Its crude experiments, secretly conducted in secluded cellars, were destined to start the world's economic advancement.

Later, when it became lawful to question superstitions, this "Invisible College" was recognized as the Royal Society of London.

❖ ❖ ❖

How times have changed since the day of Newton and Boyle! Research . . . invention . . . exploration . . . industrial advancement—not tolerated, but *demanded* by an increasingly sophisticated population. What a premium today upon Vision!

American industry right now is pioneering in the spirit of Newton and Boyle—but with this difference: it is aided and exhorted by an industrial, engineering, trade and business press whose leadership is needed more than ever. For the stupendous accomplishments of industry have themselves become industry's greatest concern, imposing penalties upon engineers, industrialists and the heads of business . . . penalties for lack of clear vision . . . penalties for not looking ahead.

❖ ❖ ❖

The McGraw-Hill publications help industry and business look ahead. Some cover the technical, design and executive problems of specific industries. Others specialize on functions common to all industry. Serving the whole sweep of American business, *The Magazine of Business* is edited for the chief executive who is concerned with *policies* as well as methods.

Penetrating basic industries where most new developments originate, each McGraw-Hill publication is a collateral aid to the others. Their united forces serve American business with the facts that are so necessary today in the making of business decisions.

THE MAGAZINE OF BUSINESS

is one of 25 McGraw-Hill publications, all actuated by the same spirit of helpfulness. 600,000 industrialists, engineers and business men subscribe regularly to these publications. More than 3,000,000 use McGraw-Hill books and magazines in their business.

The Magazine of Business
System
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Aviation
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American Machinist
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Coal Age
Engineering and Mining Journal
Bus Transportation
Electric Railway Journal
Textile World
Chemical & Metallurgical Engineering
Engineering News-Record
Electrical West
Construction Methods
Food Industries

Overseas Publications

American Machinist *(European Edition)*
Ingenieria Internacional*
The American Automobile*
El Automovil Americano*

**Published by an associate company, Business Publishers International Corporation*

PUBLICATIONS

Detroit - St. Louis - Cleveland - San Francisco - Boston - Greenville - London

Union Metal installation. Middletown, Conn. Note the heavy loading of the pole at the left.

Middletown Saved Thousands of Dollars

One after another, American cities are modernizing their street electrical equipment. Following the lead of Cleveland, Detroit and other large cities, Middletown, Conn., has installed Union Metal Fluted Steel Poles in the downtown district.

Instead of separate poles for each type of service, one set of Union Metal Poles now carries the lighting and power circuits, railway feeders, trolley span wires, traffic signals, police and fire alarm wires and the street-lighting circuit.

Tall, stately poles, spaced at wide intervals, easily bear this heavy loading and offer a sharp contrast to the old method of dozens of unsightly poles to every block. The beauty of this installation has eliminated the demand for underground wires and has saved the thousands of dollars which such construction would have cost.

In many other cities the use of Union Metal equipment has reduced the number of poles along the curb line from 50 to 75 percent—has silenced the underground line agitation. We will be glad to tell you more about how this is accomplished.

Union Metal Design No. 4306 in heights of 30" and 32" used in Middletown, Conn.

THE UNION METAL MANUFACTURING CO.

General Offices and Factory: Canton, Ohio

Sales Offices — New York, Chicago, Philadelphia, Cleveland,
Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta.

Distributors:

GENERAL ELECTRIC MERCHANDISE DISTRIBUTORS
GRAYBAR ELECTRIC CO., INC.
Offices in all principal cities

UNION METAL

DISTRIBUTION AND TRANSMISSION POLES

Rolled Steel Wheels
Coil and Elliptic Springs
Quenched and Tempered Carbon Steel Axles
Armature Shafts

Keep your equipment
out of the shops.
Use parts of - - - - - - -

“STANDARD” STEEL

STANDARD STEEL WORKS CO.
PHILADELPHIA, PA.

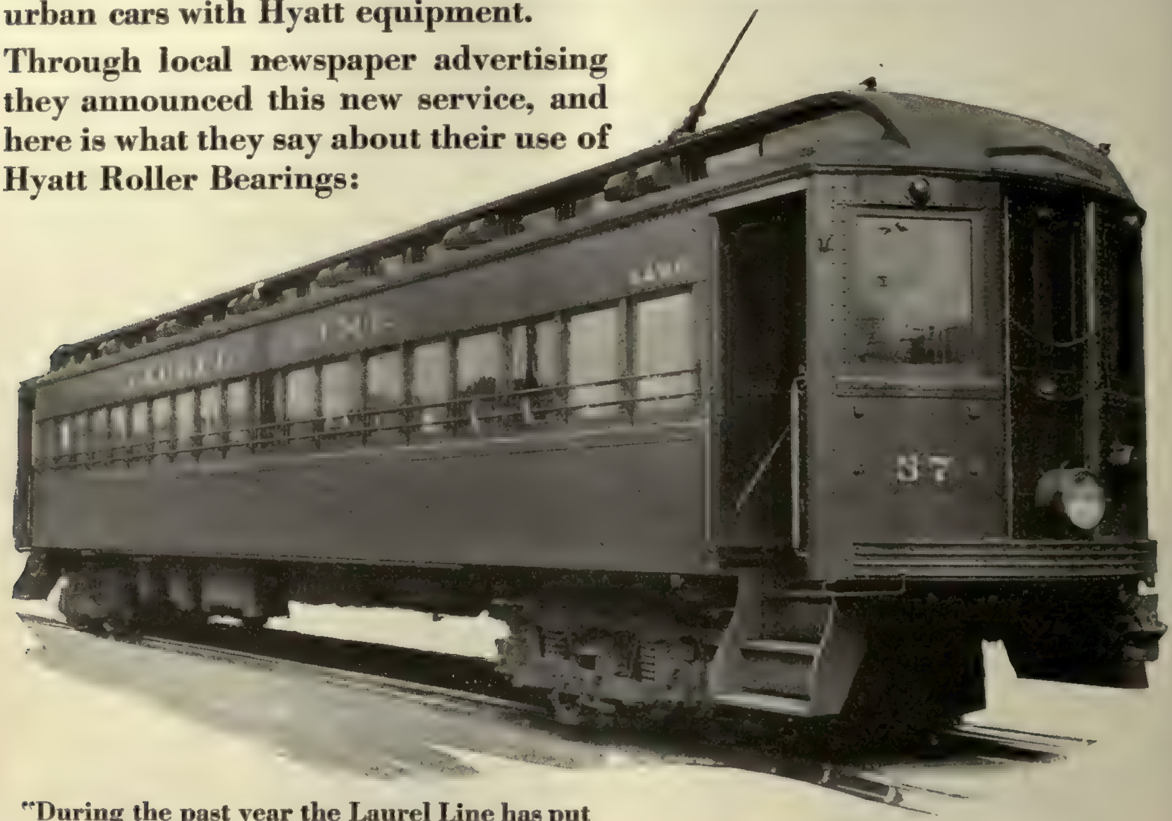
BRANCH OFFICES: CHICAGO, ST. LOUIS, NEW YORK, HOUSTON, PORTLAND, RICHMOND, PITTSBURGH, SAN FRANCISCO, MEXICO CITY

WORKS: BURNHAM, PA.

Hyatts on the Laurel Line

THE Lackawanna & Wyoming Valley Railroad, operating frequent fast electric service between Scranton, Pittston and Wilkes-Barre, Pa., recently placed in service the first of their new interurban cars with Hyatt equipment.

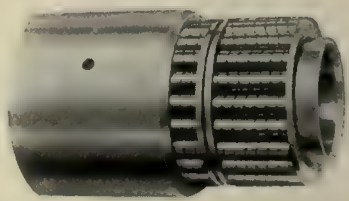
Through local newspaper advertising they announced this new service, and here is what they say about their use of Hyatt Roller Bearings:



> "During the past year the Laurel Line has put into service all-steel passenger coaches, thereby discarding wooden coaches. These modern steel coaches are 64 feet long, and are being completely equipped with Hyatt Roller Bearings, which afford the maximum in comfort, smoother riding and represent the most modern and finest steel coach equipment that it is possible to buy.
>
> Why not ride the comfortable way—the Hyattway. Ride in safety, ride with smoothness—use the Laurel Line regularly."

LACKAWANNA
&
WYOMING
VALLEY
R.R.

Building public good will with better riding...*provided the Hyattway*...is but one advantage of Hyattized journal boxes. Many operating economies are effected by the employment of these modern bearings, as well.



HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

"Canned Experience"

Make use of the other man's experience

That old saying about experience being the best teacher is absolutely sound. But most of us recite it without thinking that experience may be of various sorts—the experience of other men as well as our own, "canned experience," ready for use if you please. Why not take advantage of the experience of other men as far as we can and save not only years of time but many expensive lessons?

Do you know that a large share of the world's best research work in the fields of science, technology and business is contained in **McGRAW-HILL BOOKS?**

A single fact, a single table, a single idea may be worth many times the price of the book to you.

Buy your Books on the Budget Plan

Choose any of these McGraw-Hill Books that you would like to see—one, or two or half a dozen—as many as you wish.

Read them for ten days free—keep those you want—send back those you don't want.

If desired you may pay for the books on our monthly budget plan, provided your order amounts to $12.00 or more. The minimum monthly payment is $3.00 and the monthly installments must be large enough so that the entire account will be paid in full within six months.

There is no additional charge for books purchased on the budget plan. The prices are the same as for cash.

1

Richey—

Electric Railway Handbook

798 pages, flexible, 528 illustrations, $4.00

A thoroughly revised reference book of practical data, formulas and tables for the use of operators, engineers and students. It gives the essential reference data on all phases of electric railway construction and operation. It presents: (1) Data on subjects which come up in everyday electric railway practice. (2) Material of service to the non-technical manager or operator. (3) Reference material on electric railway practice for those who are specializing in other or allied lines.

2

Harding—

Electric Railway Engineering

Third Edition, 480 pages, 6x9, 248 illus., $5.00

A thorough revision of this standard work on the theory and practice of electric railway engineering. The book covers the principles of train operation, power generation and distribution, equipment and types of systems.

3

Kurtz—

Lineman's Handbook

550 pages, pocket size, flexible, illust., $4.00

The first book written expressly for linemen, foremen, and other employees of line departments. The book meets the growing need for a pocket volume of construction and maintenance data, procedure, and methods. It presents hundreds of kinks, shortcuts, expedients and time- and work-saving methods, as well as scores of useful diagrams, tables, and formulas for the lineman.

4

Standard Handbook for Electrical Engineers

2100 pages, 4½x7, flexible, thumb-indexed, $6.00

A widely-known encyclopedia of electrical engineering. The book covers every branch of modern electrical engineering. It is complete and reliable, and so carefully and fully indexed that its information is readily accessible.

5

Croft—

American Electricians' Handbook

823 pages, pocket-size, flexible, 900 illus., $4.00

The book is a reliable, useful handbook for wiremen, contractors, linemen, plant superintendents and construction engineers. It aims to give the practical man the facts on apparatus, materials and installation which he needs in his daily work. It is practical from cover to cover.

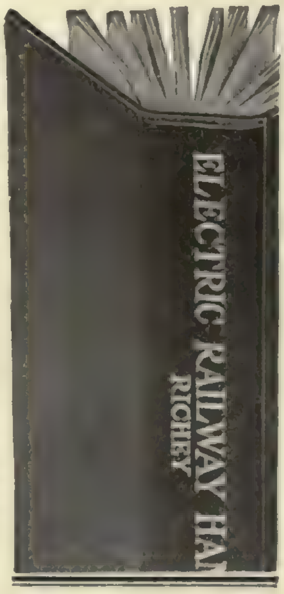
6

Blake and Jackson—

Electric Railway Transportation

Second Edition, 437 pages, 6x9, 12 illus., $5.00

A second edition of this widely known book on the transportation side of the electric railway business — getting the cars over the tracks — increasing the traffic — collecting the fares —and selling service in the face of modern conditions. Particular consideration is given to the place of the bus in modern transportation.



7

King—

Railway Signaling

369 pages, 6x9, 349 illus., $4.00

A completely adequate book on all phases of modern railway signaling. The book describes fully the construction, installation, operation and maintenance of signaling equipment, and presents a thorough discussion of principles.

8

Nash—

Economics of Public Utilities

413 pages, 6x9, $4.00

This book presents the essential facts and the most mature views upon the underlying financial and economic phases of public utility companies, with particular emphasis on electric railways, electric light and power companies and gas companies.

It discusses every angle of the public utility *as a business* and treats thoroughly such subjects as capitalization, investment features, franchises, regulation, valuation, depreciation, taxes, rates, service, accounting methods, public relations, etc.

Choose the books you want to see — and just mail the coupon

Mail this coupon to see these McGraw-Hill books

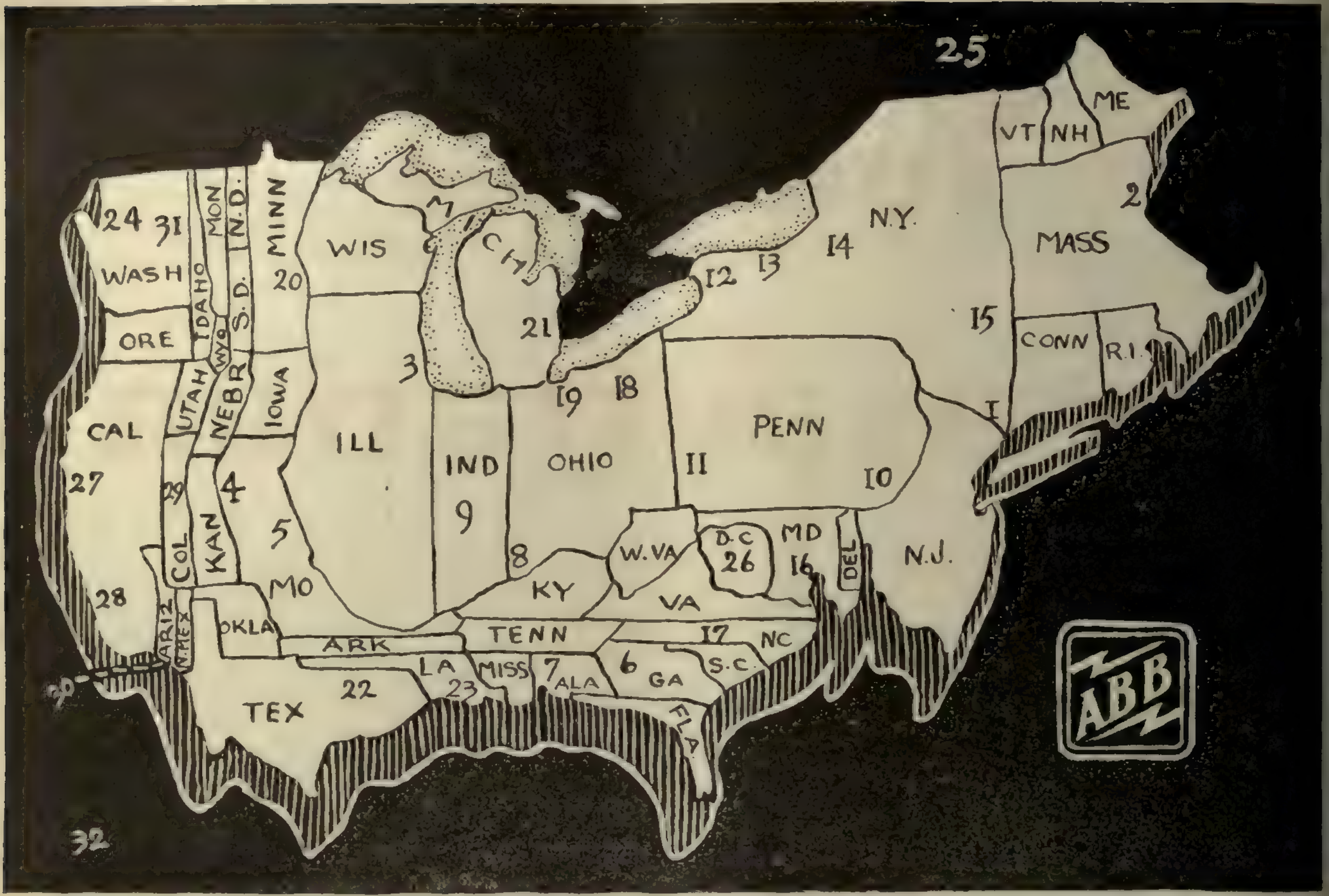
McGraw-Hill Book Co., Inc., 370 Seventh Avenue, New York.

Send me the books checked for 10 days' free examination:

....Richey's Electric Railway Handbook, $4.00.
....Harding's Electric Railway Engineering, $5.00.
....Kurtz' Lineman's Handbook, $4.00.
....Standard Handbook for Electrical Engineers, $6.00.
....Croft's American Electricians' Handbook, $4.00.
....Blake and Jacksons' Electric Railway Transportation, $5.00.
....King's Railway Signaling, $4.00.
....Nash's Economics of Public Utilities, $4.00.

I agree to return such books as I do not wish to keep, postpaid, or to remit for them within 10 days of receipt.

Name ....
Home Address ....
City ....
Position ....
Name of Company .... E. 5-29



THIS distorted map shows the various states as they would appear if their areas were in proportion to the number of wired dwellings. The numerals indicate the American Brown Boveri representatives listed below. Note how completely they cover the country.

1 American Brown Boveri Electric Corp.,
Graybar Bldg., New York City.

2 American Brown Boveri Electric Corp.,
842 Summer St., Boston, Mass.

3 Paul W. Koch & Co.,
19 S. Wells St., Chicago, Ill.

4 Henry Nixon,
Mutual Bldg., Kansas City, Mo.

5 W. L. Rose Equipment Co.,
Planters Bldg., St. Louis, Mo.

6 E. A. Thornwell,
Candler Bldg., Atlanta, Ga.

7 E. A. Thornwell,
810 Brown-Marx Bldg.,
Birmingham, Ala.

8 Beedle Equipment Co.,
Union Trust Bldg.,
Cincinnati, Ohio.

9 T. H. Hays,
315 Traction Terminal Bldg.,
Indianapolis, Ind.

10 Harris & Butler,
Real Estate Trust Bldg.,
Philadelphia, Pa.

11 E. S. Stickle Co.,
Union Trust Bldg., Pittsburgh, Pa.

12 Schiefer Electric Co.,
Ellicott Square,
Buffalo, N. Y.

13 Schiefer Electric Co.,
89 East Avenue, Rochester, N. Y.

14 Schiefer Electric Co.,
City Bank Bldg., Syracuse, N. Y.

15 Schiefer Electric Co.,
City Savings Bank Bldg.,
Albany, N. Y.

16 O. T. Hall,
432 North Calvert St.,
Baltimore, Md.

17 Albert Milmow,
217 Latonia Bldg., Charlotte, N. C.

18 Verne W. Shear & Co.,
46 East Buchtel Ave.,
Akron, Ohio.

19 Verne W. Shear & Co.,
425 Bulkley Bldg.,
Cleveland, Ohio.

20 Howard & Geeseka,
1008 Marquette Ave.,
Minneapolis, Minn.

21 F. R. Jennings Co.,
2847 Grand River Ave.,
Detroit, Michigan.

22 Paul G. Bentley Co.,
805 Allen Bldg., Dallas, Texas.

23 W. J. Keller,
203 Natchez Bldg.,
New Orleans, La.

24 T. S. Wood,
Polson Bldg., Seattle, Wash.

25 Griswold & Co., Ltd.,
1111 Beaver Hall Hill,
Montreal, Canada.

26 Commercial Engineering Co.,
1800 E St., N.W.,
Washington, D. C.

27 Utilities Equipment Corp.,
1643 Russ Bldg.,
San Francisco, Calif.

28 Utilities Equipment Corp.,
401 Bartlett Bldg.,
Los Angeles, Calif.

29 Franklin Sales Co.,
1429 18th St., Denver, Colorado.

30 J. E. Redmond,
218 Security Bldg.,
Phoenix, Arizona.

31 Tinling & Powell,
27 Main Ave., Spokane, Wash.

32 Manila Machinery & Supply Co.,
Manila, P. I.

American Brown Boveri Electric Corp.,
Main works, Camden, N. J.

AMERICAN BROWN BOVERI

You Sell Transportation –

Why not Buy Transportation

?

A Motor Coach i
the Work It Wil

DODGE
BROTHERS

CHRYSLER MOTORS PRODUCT

DODGE
MOTOR

SOLD BY DODGE BROTHER

Only as Good as
do Day after Day

In Dodge Brothers Motor Coaches, Dodge Dependability puts a plus value on Safety, Speed, Power, Quiet and fine Appearance ❦ ❦ ❦

The profit possible for operators who *sell* transportation is dependent in large measure upon how they *buy* transportation.

Purchasers of Dodge Brothers Motor Coaches buy transportation wisely—can sell it profitably. These purchasers measure appearance, comfort, safety, speed, economy, dependability—all in terms of what these features contribute to the profitable work that a motor coach will do day after day.

Dodge equipment takes them closest to the ambition of every operator—to carry more passengers with more satisfaction and at lower cost.

BROTHERS
OACHES

ALERS EVERYWHERE

Living for and not off the Industry....

This expression, used recently of Electric Railway Journal by a well-known electric railway executive,* expresses exactly the guiding policy of the paper during its more than 40 years of service to the Industry.

In those seven words lies the reason why Electric Railway Journal has always been received in the light of a friend and counselor. Behind them is the spirit which was responsible for the recent presentation to this paper of the first Associated Business Papers' Award established in 1927 for Outstanding Editorial Service.

Electric Railway Journal

*Mr. Walter A. Draper, President,
The Cincinnati Street Railway Company.

Last chance

—to indicate your subscription choice

For your convenience, we are again outlining the new publishing plan of Electric Railway Journal. There will be 13 issues of the monthly magazine—twelve regular issues and the 13th issue which will be either a Convention Issue or Report Issue depending upon the date of the A.E.R.A. Convention itself.

Electric Railway Journal *News,* to be issued each Saturday except in those weeks in which the monthly publication appears, will supplement the monthly magazine and give to busy executives the important timely news of the industry.

Present subscribers are now offered a choice of:

1. The regular subscription price of the magazine is being reduced from four dollars to three dollars yearly. The price of the *News* will be one dollar for subscribers to the magazine, two dollars for all non-subscribers. If you wish the new monthly—*without* the *News*—your present subscription will be *extended* on a dollar-for-dollar basis.

2. If you are interested in receiving *both* the 13 large monthly issues and the 39 supplementary *News* issues, your subscription will not be extended, but will retain its present expiration date.

You have already seen two copies of the bigger and stronger monthly publication. You have also received two complimentary copies of the *News* which were mailed to all subscribers, so that they could see for themselves what type of information it furnished. May we now have your subscription choice as outlined?

If we do not hear from you shortly, we will assume that you wish the monthly magazine only, and your subscription will be extended. But if the *News* service can also be valuable to you, please be sure to return this coupon TODAY.

Electric Railway Journal
10th Ave. at 36th St., New York, N. Y.

CHECK ONE:

☐ I wish to receive only the new monthly. Kindly extend my present subscription.

☐ I wish to receive *both* the monthly and the *News.* I understand that the expiration date of my subscription will remain the same.

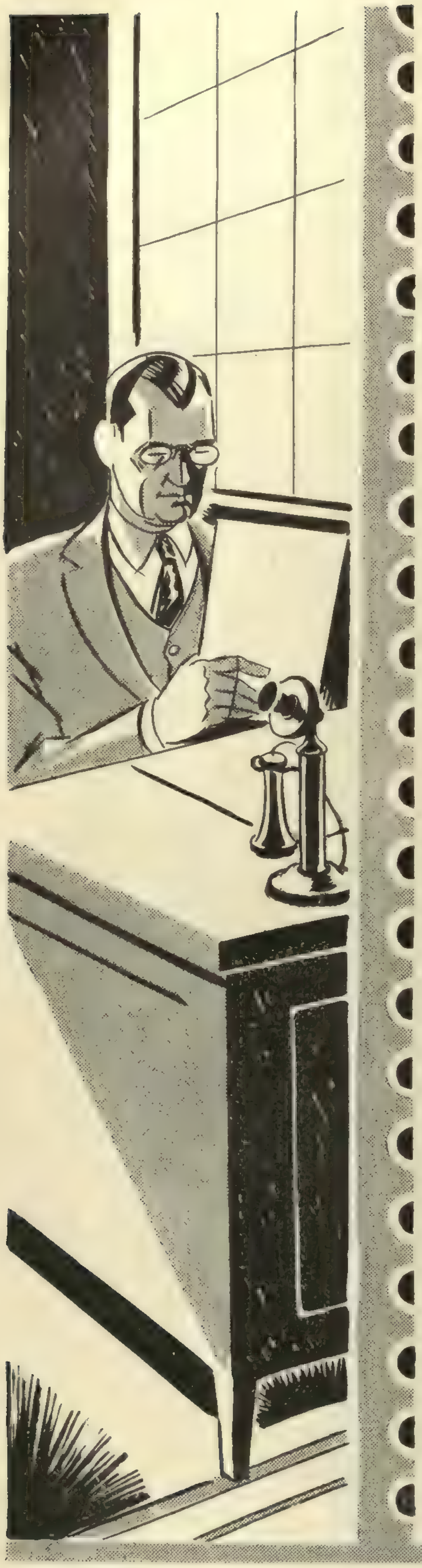
....

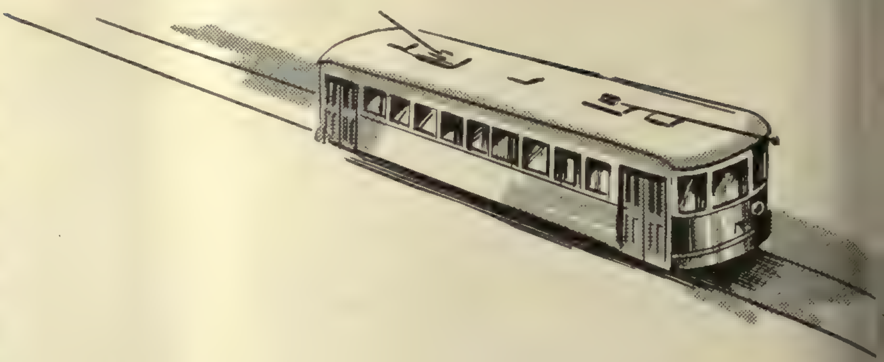
NAME ....

ADDRESS ....

CITY .... STATE ....

F. E.R.J. 5-29





Brain . . .

A FEW minutes' planning and figuring may save hours of digging and patching.

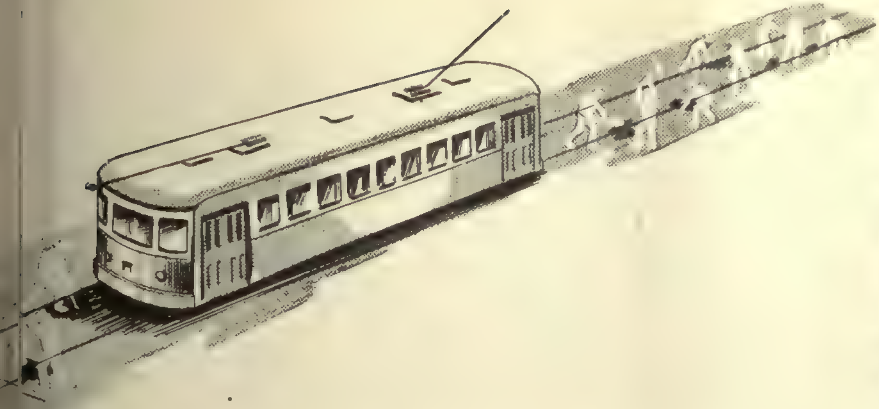
Probably that is the reason so many companies are turning away from the old-fashioned method of patching rail joints to the newer method of Thermit Welding.

Thermit Welding is not just a better way of joining rails, —it is an entirely different way. For it ELIMINATES

THERMIT

METAL & THERMIT

CHICAGO BOSTON 120 BROADWAY



replaces Brawn

track maintenance

THE JOINT. At the same time it eliminates the necessity of ever digging up the pavement and patching.

Consider this when you are planning your crusade against worn rail joints. An ounce of prevention is cheaper than a pound of cure.

CORPORATION

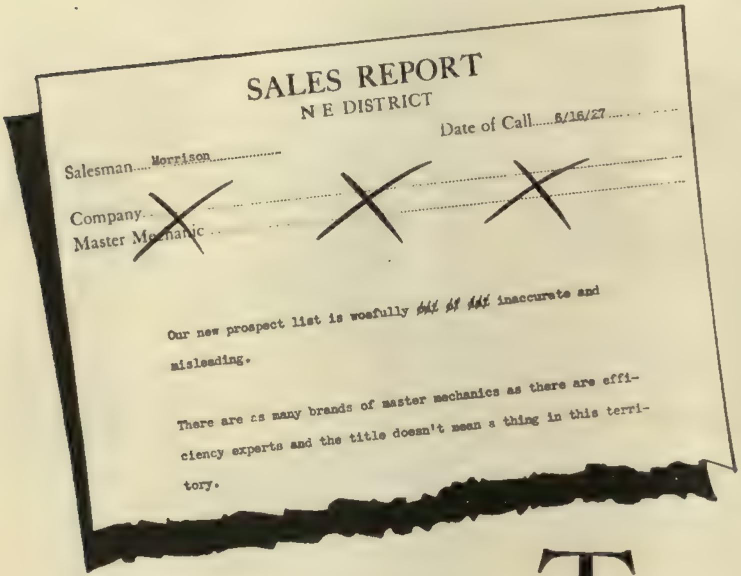
EW YORK, N.Y.

SOUTH SAN FRANCISCO

THERMIT

This is one of a series of McGraw-Hill advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

Is his title backed up with real buying authority?



SALES REPORT
N E DISTRICT

Date of Call 6/16/27

Salesman Morrison

Company

Master Mechanic

Our new prospect list is woefully ~~out of dat~~ inaccurate and misleading.

There are as many brands of master mechanics as there are efficiency experts and the title doesn't mean a thing in this territory.

What can you expect from an industrial advertising campaign that is planned to cover a prospect list built on this basis?

THE one reliable method of running down the real buyers is to seek them by actual operating responsibilities. The important thing is not what they are called but what they do.

This principle comes out of McGraw-Hill's years of experience in circulation and editorial service throughout American Industry.

The confusion of titles in industry is discussed on pages 29 to 33 in *Industrial Marketing at Work*. A copy of this book will be delivered to executives interested in selling and advertising to industry.

—The publishers

Every Stage
A Step to Multiplied Mileage

The principal object of the operation pictured above is to remove from the center of the hub of a Gary Wheel Blank a cylinder of steel concentric with the vertical axis of the ingot from which it was made. The object is accomplished by placing the blank in a centering die and pressing through it a punching die. . . . . . This is just one of many stages in the journey that leads from wheel blank to shipping dock. . . Each is carefully designed according to most modern practice. . . Each makes use of long experience and equipment kept at maximum efficiency by constant inspection and maintenance. . . Each contributes its part to multiplied mileage.

Our wheel engineers are at your service.

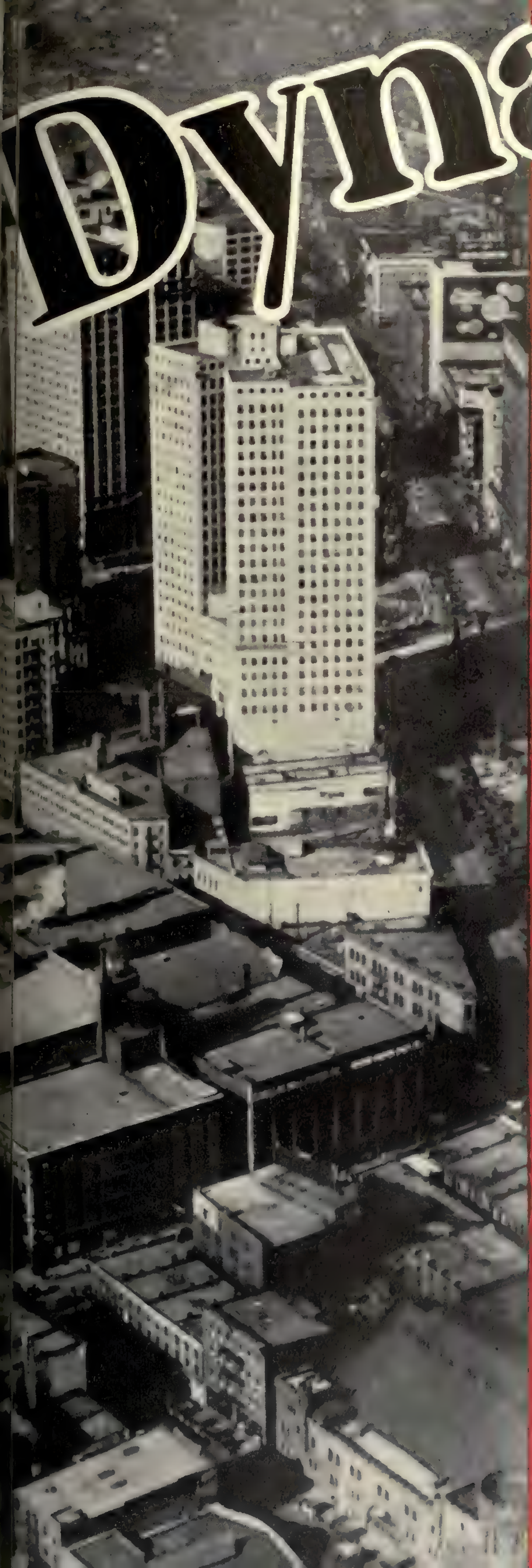
Illinois Steel Company
Subsidiary of United States Steel Corporation
General Offices:
208 South La Salle Street, Chicago

GARY
WROUGHT STEEL WHEELS

ADVERTISING has become an indispensable part of our national life. It performs a genuine service to a fast-moving public. It has been identified with the Electric Railways for such a long period that the public has come subconsciously to value the guidance of this phase of the service in the fulfilling of everyday wants.

Collier Service car cards are not only a part of Electric Railway Service, but a dependable source of revenue as well.

BARRON G. COLLIER
INC.
CANDLER BLDG.—NEW YORK CITY
Car Card Advertising Almost Everywhere



Dynamic DETROIT

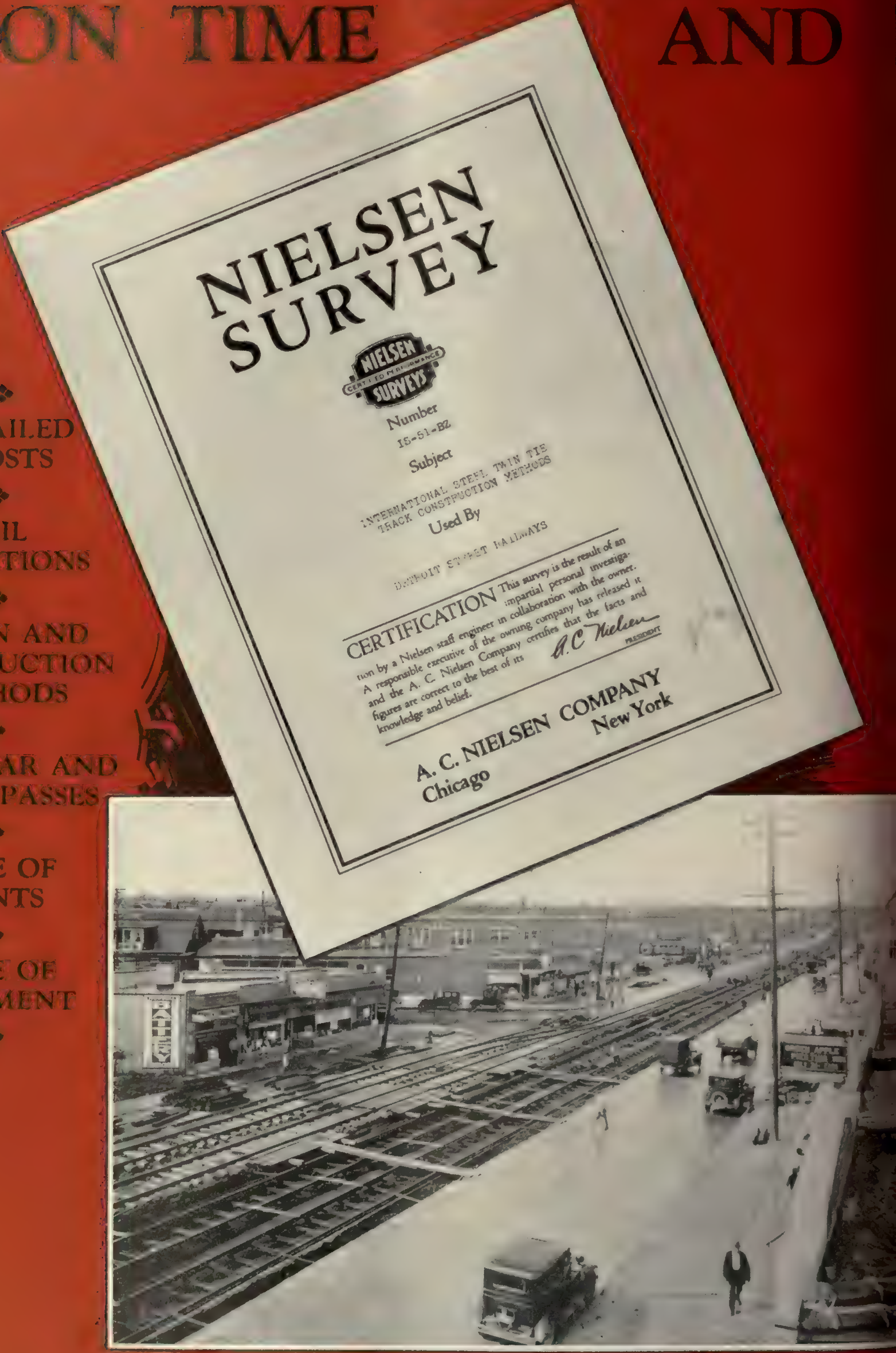
81.85 MILES of TWIN TIE TRACK SINCE 1920

Fairchild Aerial

NIELSEN
VEY

turn the page

USE THE NIELSE
ON TIME AND



NIELSEN SURVEY

Number
IS-51-BZ

Subject

INTERNATIONAL STEEL TWIN TIE TRACK CONSTRUCTION METHODS

Used By

DETROIT STREET RAILWAYS

CERTIFICATION This survey is the result of an impartial personal investigation by a Nielsen staff engineer in collaboration with the owner. A responsible executive of the owning company has released it and the A. C. Nielsen Company certifies that the facts and figures are correct to the best of its knowledge and belief.

A. C. Nielsen
PRESIDENT

A. C. NIELSEN COMPANY
Chicago New York

Grand River Ave., Detroit, Mi

◆

DETAILED COSTS

◆

SOIL CONDITIONS

◆

DESIGN AND CONSTRUCTION METHODS

◆

RAIL WEAR AND WHEEL PASSES

◆

TYPE OF JOINTS

◆

TYPE OF PAVEMENT

◆

STEEL TWIN TIE TRACK

URVEY FACTS
RAFFIC TESTED TRACK
plan—

MORE PERMANENT, LOWER COST PAVED CONSTRUCTION

Steel Twin Tie Construction adopted in Detroit in 1920.

Records show 81.85 miles of Steel Tie Track in service.

Advantages are:

Reduction in amount of excavation and concrete foundation work.

Faster progress and less delay in opening streets to traffic.

Complete elimination of sinking track caused by disintegration or washing out of sand ballast.

Water tight bond between rails and concrete pavement.

No heaving or cracking of paved surface.

The property is satisfied that rail wear will be the determining factor in the life of the track as none of the track has even approached the end of its usefulness.

◆

This report is of vital interest to all Electric Railway Executives, and answers in an unbiased way all questions about Steel Twin Tie Track performance under heavy duty traffic. Five hundred copies of this report are being prepared for mailing. May we send you your copy today?

The International Steel Tie Co.
CLEVELAND, OHIO

THE BASE OF
MODERNIZATION

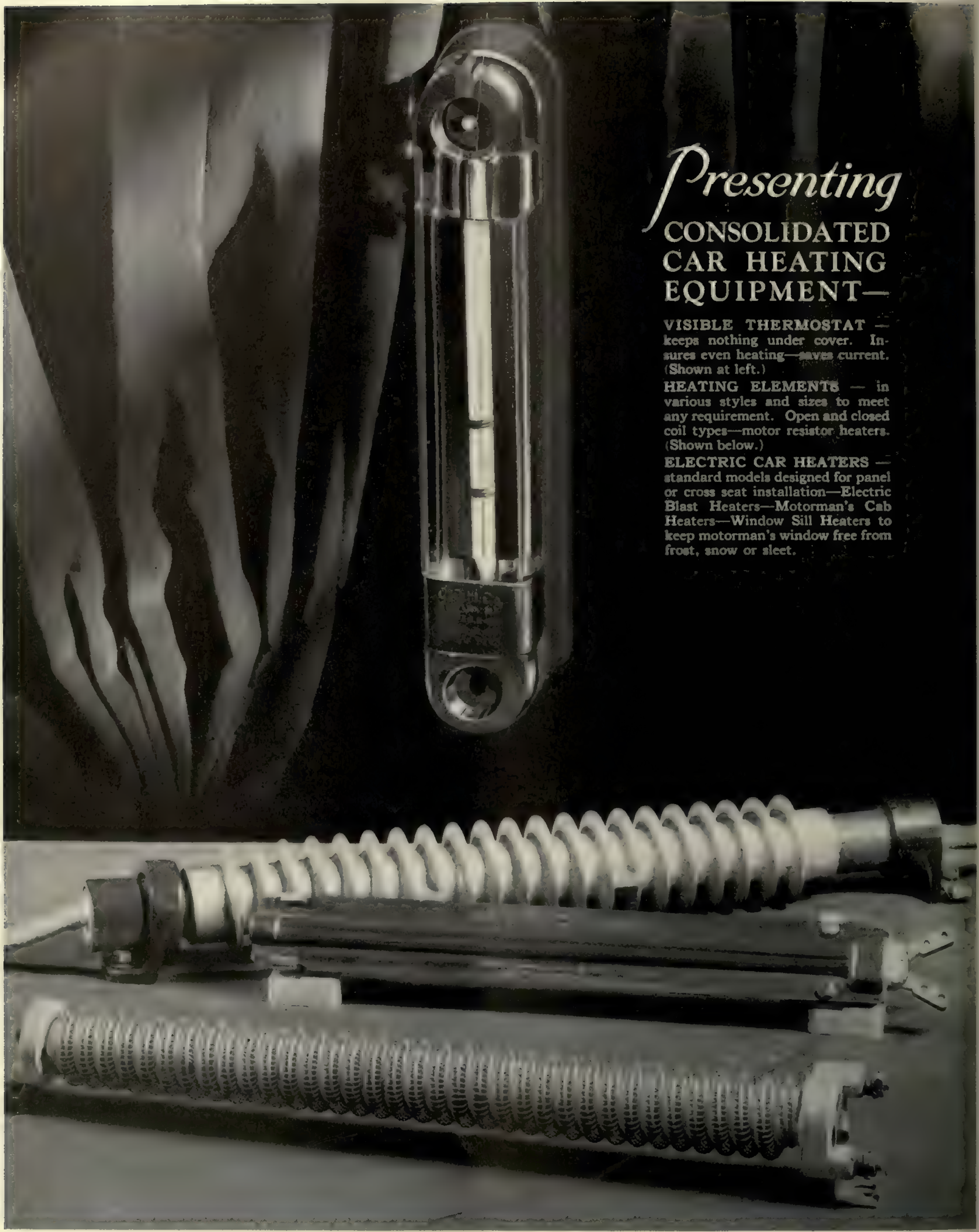
The International Steel Tie Co.
Cleveland, Ohio

Send us the NIELSEN DETROIT SURVEY.

Name ....

Title ....

Company ....



Presenting

CONSOLIDATED CAR HEATING EQUIPMENT—

VISIBLE THERMOSTAT — keeps nothing under cover. Insures even heating—saves current. (Shown at left.)

HEATING ELEMENTS — in various styles and sizes to meet any requirement. Open and closed coil types—motor resistor heaters. (Shown below.)

ELECTRIC CAR HEATERS — standard models designed for panel or cross seat installation—Electric Blast Heaters—Motorman's Cab Heaters—Window Sill Heaters to keep motorman's window free from frost, snow or sleet.

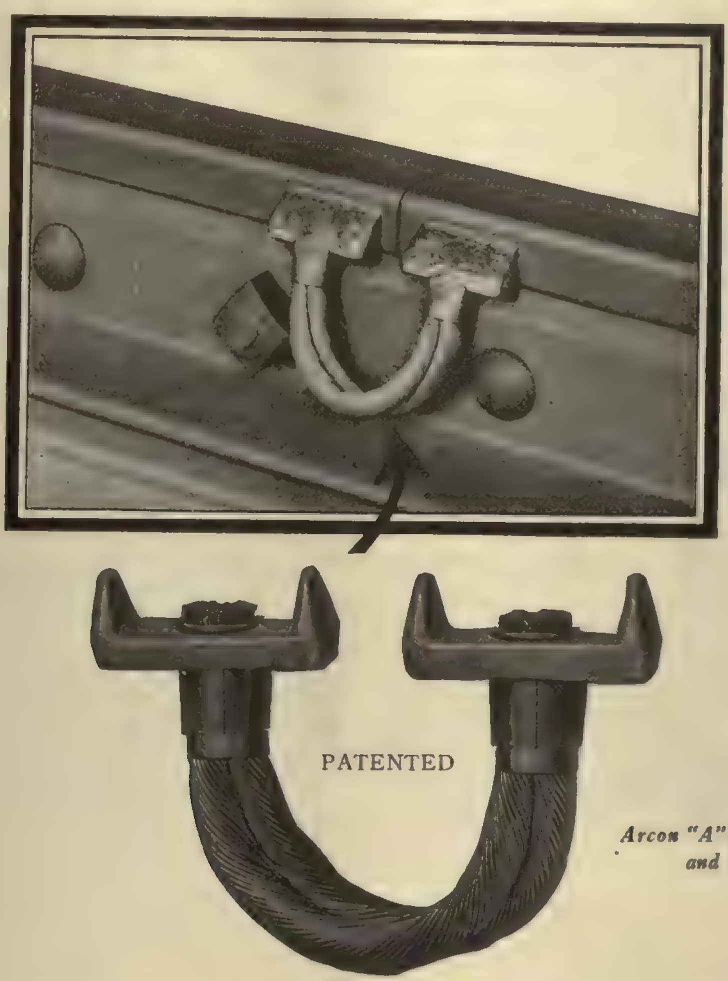
CONSOLIDATED CAR-HEATING COMPANY, INC.

NEW YORK ALBANY CHICAGO

American Steel & Wire Company

ARCON RAIL BONDS

"Trade Mark Registered"



Arcon "A" Bond in detail and installed

A NEW principle of design is embodied in Arcon Rail Bonds. *This is the open terminal.*

The open terminal has many distinct advantages. All terminals provide for *easy* arc manipulation. The end of the copper conductor is approximately one-eighth of an inch from the rail, and located in an open space which insures perfect welding of the copper wires. The sloping surface of the terminal after welding is a novel and important feature in arcweld bonds.

Be convinced by a practical demonstration which we will gladly give you at your convenience.

Prices and literature mailed upon request.

AMERICAN STEEL & WIRE COMPANY

Subsidiary of United States Steel Corporation

CHICAGO.....208 S. La Salle St.
CLEVELAND........Rockefeller Bldg.
DETROIT.......Foot of First Street
CINCINNATI.... Union Trust Bldg.
MINNEAPOLIS—ST. PAUL..........
Merchants Nat'l Bank Bldg., St. Paul
ST. LOUIS..........506 Olive Street
KANSAS CITY.......417 Grand Ave.
OKLAHOMA CITY ....
First Nat'l Bank Bldg.
BIRMINGHAM.. Brown-Marx Bldg.
MEMPHIS.............................
Union and Planters Bank Bldg.
NEW YORK..........30 Church St.
BOSTON...............Statler Bldg.
PITTSBURGH............Frick Bldg.
PHILADELPHIA......Widener Bldg.
ATLANTA..........101 Marietta St.
WORCESTER........ 94 Grove St.
BALTIMORE . . . 32 S. Charles St.
BUFFALO..........670 Ellicott St.
WILKES-BARRE Miners Bank Bldg.
DALLAS ...... Praetorian Bldg.
DENVER.. First Nat'l Bk. Bldg.
SALT LAKE CITY, Walker Bank Bldg.

UNITED STATES STEEL PRODUCTS COMPANY, San Francisco, Los Angeles, Portland, Seattle

PITTSBURGH

Advertises the Weekly Pass

THE Pittsburgh Railways began using weekly and Sunday passes in 1925. At that time we helped them select a type of pass best adapted to the problems of that city. The years following have shown a great rise in popularity for this form of fare collection. Pittsburgh is advertising the passes because they realize the advantages *to the operating company*. They are:

- Cash in advance.
- Elimination of change-making during rush hours.
- Control of fare at one source.
- Greater number of passengers carried due to attractive rate.

Globe experience should be of great value to you in adopting and initiating a pass system. Let us acquaint you with our service in all types of paper fares.

These unique posters, in attractive colors, were employed by The Pittsburgh Railways to drive home the sale of weekly and Sunday passes.

GLOBE
TICKET COMPANY
PHILADELPHIA

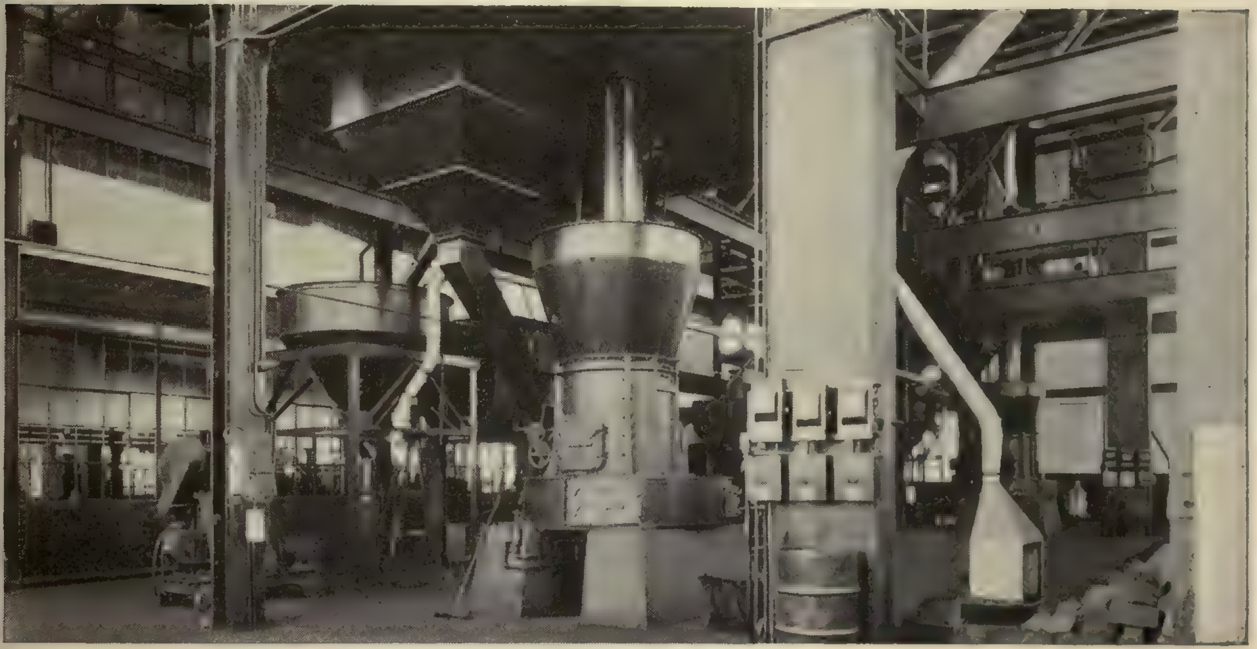
Factories		Sales Offices	
Philadelphia Los Angeles Boston	New York Jacksonville	Syracuse Baltimore Cincinnati	Cleveland Pittsburgh Springfield, Mass.

Let GLOBE do it

◆◆ BEHIND THE PYRAMIDS—5 ◆◆

N C C

It takes more than CARBON to make a brush



Part of crushing and milling equipment

OUT of the fiery furnace come hard blocks of practically pure carbon, but these are not brushes and useful brushes could not be sawed out of them.

The blocks are crushed into small bits in a powerful machine. Another machine grinds the carbon into fine flour. The laboratory, as usual, tests each step. The flour, for instance, must meet rigid tests for electrical resistance and fineness.

Not only is this flour tested, but, to insure uniformity of the product, the output from several mills is mixed and blended after it has been passed by the laboratory.

Thus once more a basic form of carbon is produced in a very pure, exactly uniform, scientifically controlled state.

This is but one example of the thorough control we exercise over the smallest detail of manufacture. This control is your assurance and ours, too, that any given grade of National Pyramid Brushes will always be the same, for by exactly duplicating the conditions of manufacture we duplicate the grade. Standard performance thereby is assured. The NCC brushes that are giving you such perfect service today can be replaced with precisely similar ones at any time in the future. The Data Sheet System makes shipments speedy and accurate.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown on request to any organization of engineers or students.

NATIONAL CARBON COMPANY, Inc.

Unit of Union Carbide UCC *and Carbon Corporation*

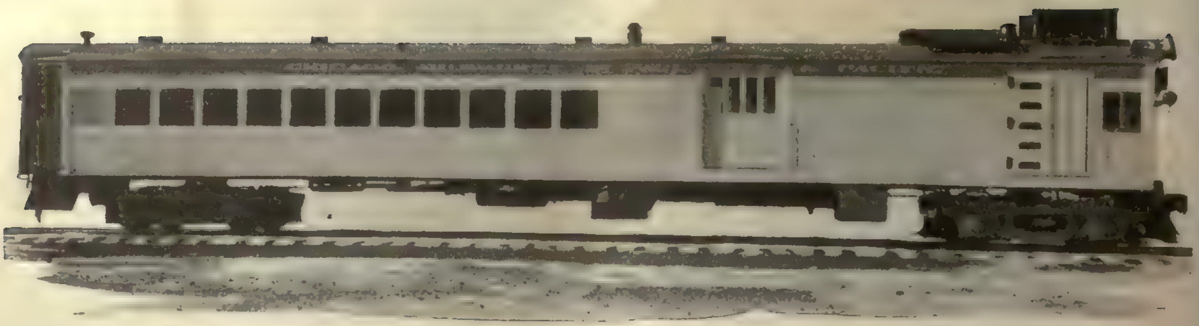
Carbon Sales Division

SILVER STRAND CABLE TRADE MARK REGISTERED

Cleveland, Ohio

Branch Offices and Factories

Jersey City Pittsburgh Chicago Birmingham San Francisco



One of the cars to which Simplex Clasp Brakes have been applied

SIMPLEX MULTIPLE UNIT CLASP BRAKES

Railroads would not purchase passenger cars without "Simplex Clasp Brakes."

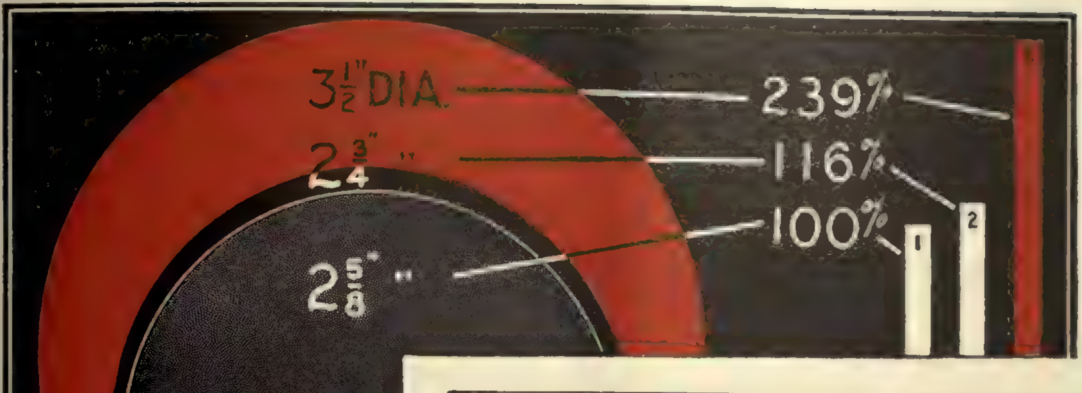
Why not specify "Simplex Multiple Unit Motor and Trailer Truck Clasp Brakes" for Gas — Electric and Electric Cars.

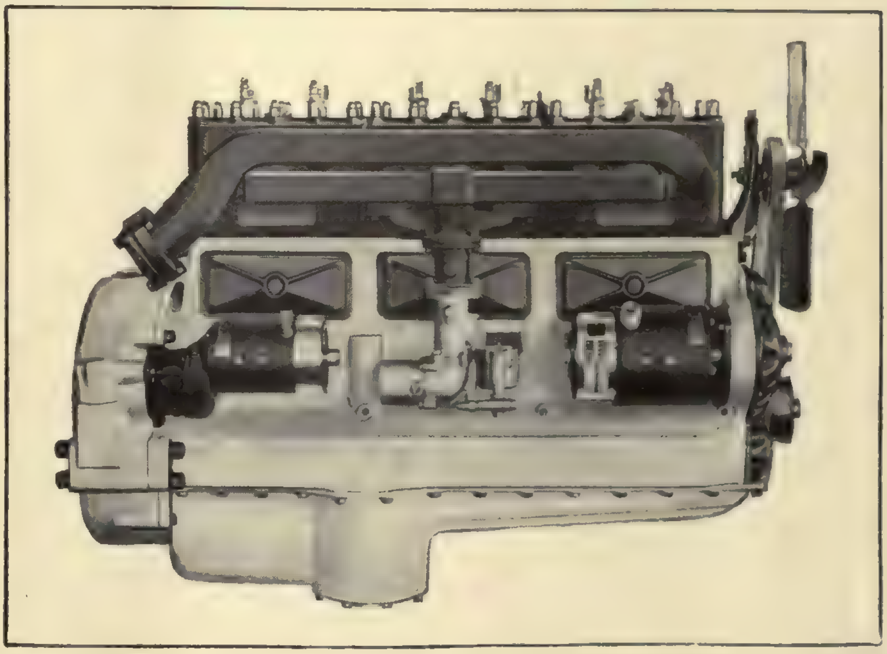
Send us your inquiries for information and designs.

The mechanically correct Brake for a Modern Car.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

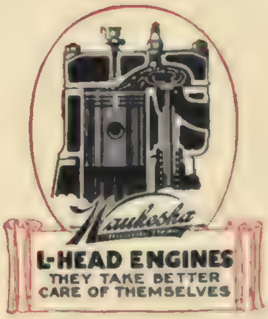




The above diagram shows crankshaft sizes of three well known big six engines, with diameters of 2⅝-in. and 2¾-in.—and Waukesha's crankshaft, 3½-in. White lines show their relative stiffness. If shaft No. 1 is considered 100% satisfactory, then shaft No. 2 has an excess strength of 16% and the Waukesha shaft No. 3 has 139% excess strength.

the crankshaft *that never fails*

---huge and thick-cheeked---of chrome nickel steel, heat treated---supported on four arch trussed bearings---Waukesha's 3½-inch crankshaft guarantees positive dependability under even the severest service requirements. Never has this Waukesha crankshaft been known to fail. Thousands of miles without a bearing adjustment is not exceptional---it's a fixed habit with Waukesha. That's only ONE REASON why the most modern motor coaches are powered with Waukesha RICARDO HEAD Long Life Engines. Write Automotive Equipment Division for Bulletin No. 710.

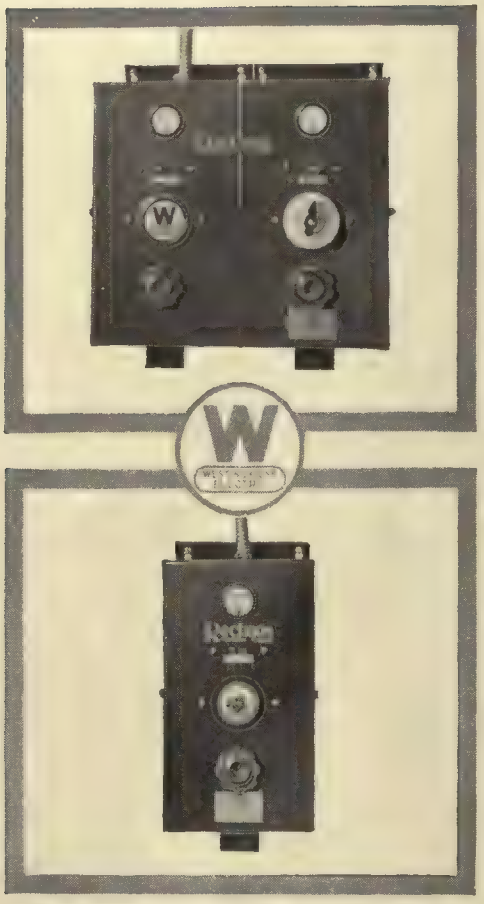

Waukesha
L-HEAD ENGINES
THEY TAKE BETTER CARE OF THEMSELVES

WAUKESHA MOTOR COMPANY

New York Office: 8 West 40th St.
WAUKESHA, WISCONSIN
San Francisco: 7 Front Street

Exclusive Builders of Heavy-Duty Internal Combustion Engines for Over Twenty Years

Cuts operating costs!



Rectigons are made in two sizes, 15 and 30 battery capacity, at $75 net and $135 net, respectively.

Even before you've charged a single battery on your Rectigon it has helped to lay the foundations for greater battery charging economy for you. The first cost of the Rectigon is low. The installation cost is low. No special provisions for its installation are required and one man can have it ready to operate in less than an hour.

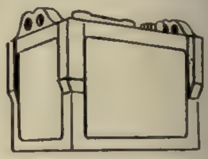
Installed and operating, the Rectigon continues to pile up a record for low operating costs. Its efficiency — higher than in any other type of charging equipment — means that more of the power you pay for reaches the battery. You profit there. Long and uniform bulb life, nothing to wear out or deteriorate, no special maintenance cost — these factors are a further help in keeping operating costs low and battery charging efficiency high.

You will be interested in the booklet, "More Power to the Battery." Write for a copy.

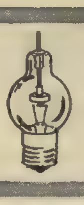
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
Merchandising Department East Pittsburgh, Pa.

Westinghouse

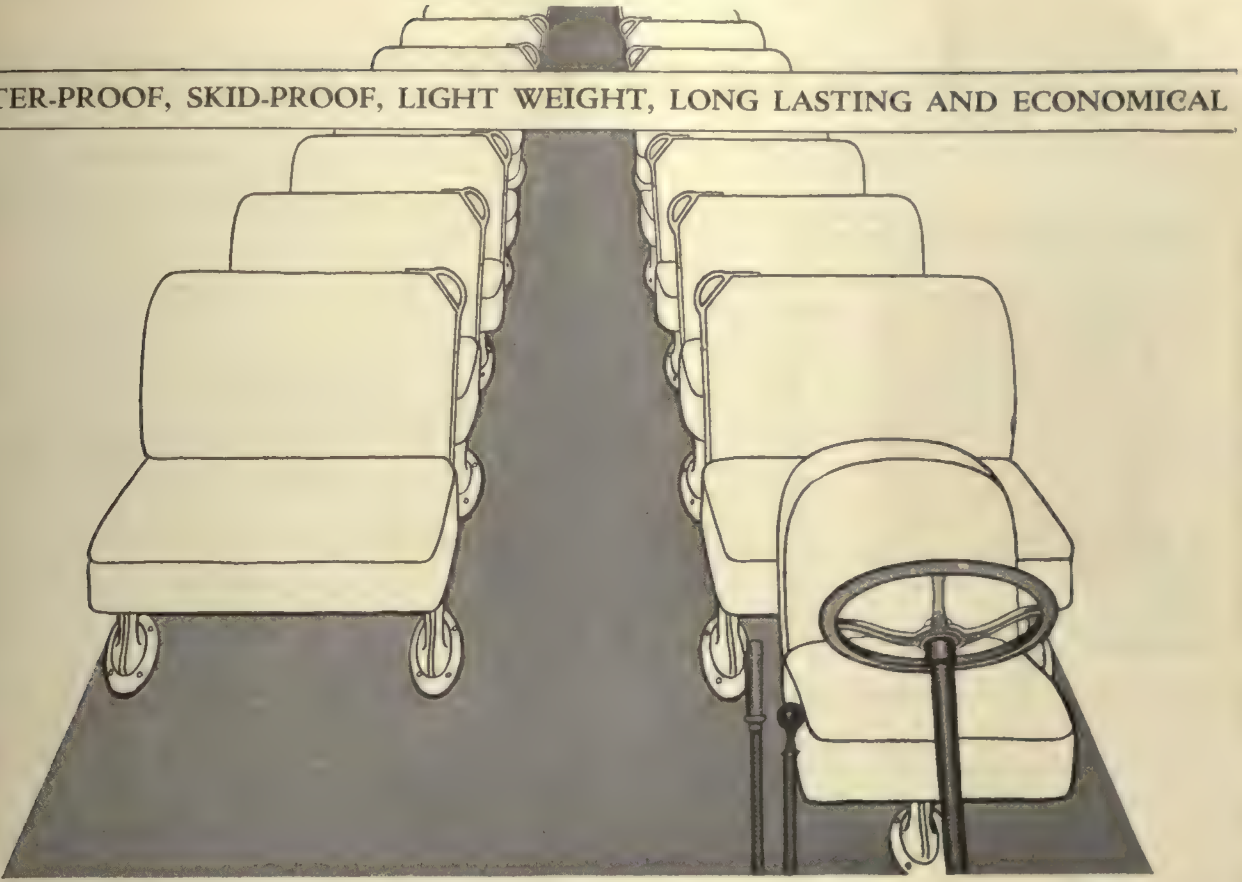
Use only genuine Westinghouse Bulbs for replacements

. . . . each battery 

charged with this rectigon

and this bulb  gives you

a lower charging cost


WATER-PROOF, SKID-PROOF, LIGHT WEIGHT, LONG LASTING AND ECONOMICAL

Keep your Bus Floors *always* New at *minimum cost* with J-M MASTICOKE

J-M MASTICOKE provides a floor which will last the life of your busses at *one low cost.* Its tough, resilient composition is made to withstand the wear of millions of footsteps. The vibration of thousands of miles of travel will not crack it. J-M Masticoke will eliminate floor repairs from your maintenance bills.

This modern bus flooring will also add materially to the appearance of your busses. It is furnished in dark gray and six attractive colors to harmonize with interior finish. It never grows shabby—its good appearance will help keep your busses always looking spic and span.

Skid-proof—Water-proof

Passengers will not slip on Masticoke Flooring. Whether new or old, its anti-skid tread is effective in any weather. J-M Masticoke is thoroughly water-proof, is unaffected by acids, and gives complete protection to the floor structure it covers.

J-M Masticoke is easily cleaned by simply flushing with water. It dries quickly and is odorless. It will not retain dust, dirt or germs. It is fire-retardent and also acts as a valuable insulation against the cold.

Tested Service

J-M Masticoke Flooring has long given satisfactory service on busses as well as railroad coaches and Pullman cars. More and more bus fleet owners are using this flooring to reduce costs. Johns-Manville service to busses includes insulation for side walls and roofs, clutch facings, packings, brake blocks, and lining. Return the coupon below and get the full particulars on this modern economical flooring.

Johns-Manville

SERVICE TO
BUS TRANSPORTATION

JOHNS-MANVILLE CORPORATION
Electric Railway & Motor Bus Division
New York Chicago Cleveland San Francisco Toronto
(Branches in all large cities)

Please send me full particulars on J-M Masticoke Bus Flooring.

Name..

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In These Days of Traveled Highways

With automobiles, trucks, buses speeding along the Nation's highways, the necessity of avoiding crossing accidents becomes acute.

Protect *your* crossings and passengers with Nachod Highway Crossing Signals. They warn two ways—by bell and flashing lights. They greatly reduce the liability of costly law suits with their attendant loss of prestige and good will.

The red flashing projectors give a brilliant and arrestive indication. They are actuated entirely from the trolley power and at the highest car speeds. The separate motorman's pilot tells him the signal is working when he passes the starting contactor.

Write us for quotation, specifying whether lights and bell, or lights only are desired; whether for a single or double track crossing and give sketch if there are any switches in the protected zone. Yellow caution lights near base may be omitted if desired. All *four* projectors may be mounted on *one* standard.

Nachod Highway Crossing Signal with flashing red lights and bell. An installation with two standards on the Galveston-Houston Interurban Railway.

N-A-C-H-O-D Spells Safety

Nachod and United States Signal Co., Inc., Louisville, Ky.

We Also Manufacture

Turn-right Signals, Single Track Permissive and Absolute Signals, Stub End Signals, Rear Protection Signals, Annunciator Signals, Headway Recorders.

—for Zone Fare Collections

THE COIN AUTOMATICALLY AND VISIBLY RECORDS THE FARE ON BOTH THE FARE BOX AND REGISTER
IN 057

The New Three coin fare box

Zone fare collections are exceedingly simplified with the new Johnson Three Coin Electric Fare Box.

Nickels, dimes, and quarters are all deposited in the same slot and recorded on the same register.

In Johnson Electric Fare Systems the coin does the work—automatically and visibly, registering the amount paid. Electric fare registers also fit in with the Modern DeLuxe car interiors. Concealed wiring, attractive fare boxes and registers, plus the fact that they give you greater speed and accuracy should make them your choice on new or old equipment.

Johnson Fare Box Company

CHICAGO
4619 Ravenswood Ave.

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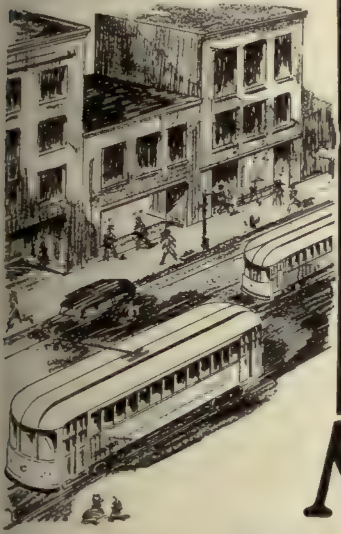
Over 6,000 Type J Electric Fare Boxes have been placed in service in the last 4 years.

Standardize on these products because *of their economy*

MORE-JONES
Armature Babbitt Metal



MORE-JONES Quality Products are highly economical from the standpoint of first and last cost as also from every angle of service efficiency.

Fifty-five years of service in the railway field has enabled us to fully meet your requirements. Take advantage of our experience and the unexcelled and uniform quality of MORE-JONES products.

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MORE-JONES
Trolley Wheels and Harps

"Tiger" Bronze
Axle and Armature
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MORE-JONES
QUALITY PRODUCTS

ALL types of City and Interurban cars of latest design and Modern construction are built by—

CUMMINGS CAR AND COACH CO.

Successors to McGuire-Cummings Mfg. Co.

111 W. Monroe St.
Chicago, Ill.

PORTER'S

NUT SPLITTERS—CHAIN CUTTERS
BOLT CLIPPERS—SHEAR CUTTERS

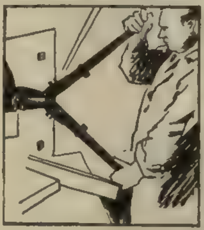
A Porter Nut Splitter will remove a battered, frozen or rusted nut from a bolt with less labor, without "jamming" the bolt threads and in less time than it takes to prepare a monkey wrench for the work.

Porter's Nut Splitters come in two types and several sizes. The type pictured above operates with the handles parallel to the bolt. Another type cuts with handles at right angles to the bolt. Both are portable and may be used in any position and in spaces otherwise difficult to work.

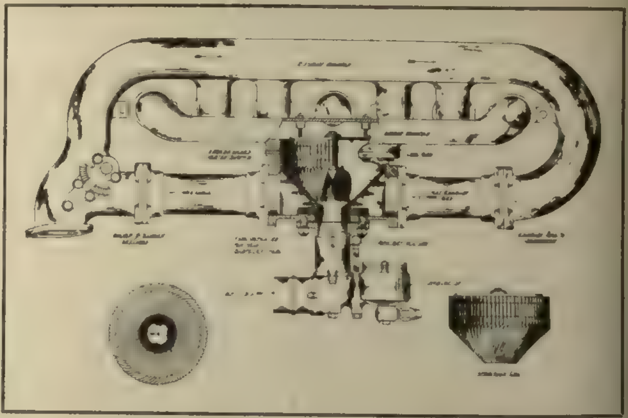
Write for illustrated folder on Porter's Tools—Nut Splitters, Chain Cutters, Bolt Clippers and Shear Cutters

H.K.Porter, Inc. 24 Ashland St., Everett, Mass.

Porter's Tools cover a wide range of uses in all types of industry. On Construction work, in factories and shops they save time, save labor and are extremely efficient. They are portable—operate anywhere and in any position.



There are Porter Bolt Clippers which cut up to a ¾" bolt or anything smaller. The Nut Splitters up to a nut, either hex or square, of a ¾" bolt. Chain Cutters cut case hardened chain up to ½" steel links. Shear Cutters for heavy flat stock and wire rope.



Godward Gas Generator in position

You can now use
Fuel Oil
in buses with the

Godward Gas Generator

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H. A. HEGEMAN, President — J. M. PRATT, First Vice-Pres.
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Easy, Economical To Install Under Traffic

THE DAYTON INTEGRAL SYSTEM OF TRACK AND PAVING STRUCTURE

Installation Under Traffic

Ease and economy of installation under traffic—a most useful feature of the Dayton Integral System of Track and Paving Structure, and in many recent installations, demonstrated to the complete satisfaction of the Engineers.

This progressive development

HE DAYTON INTEGRAL SYSTEM O

THE DAYTON MECHANICA

Exceptionally Low Cost Per Track Foot

is something we feel every Track Engineer will be interested in discussing with us further.

Traffic is not interrupted at all. Cost is moderate per track foot.

And the finished track is good for many years with no major maintenance at all.

RACK AND PAVING STRUCTURE
CO., ~ DAYTON, OHIO

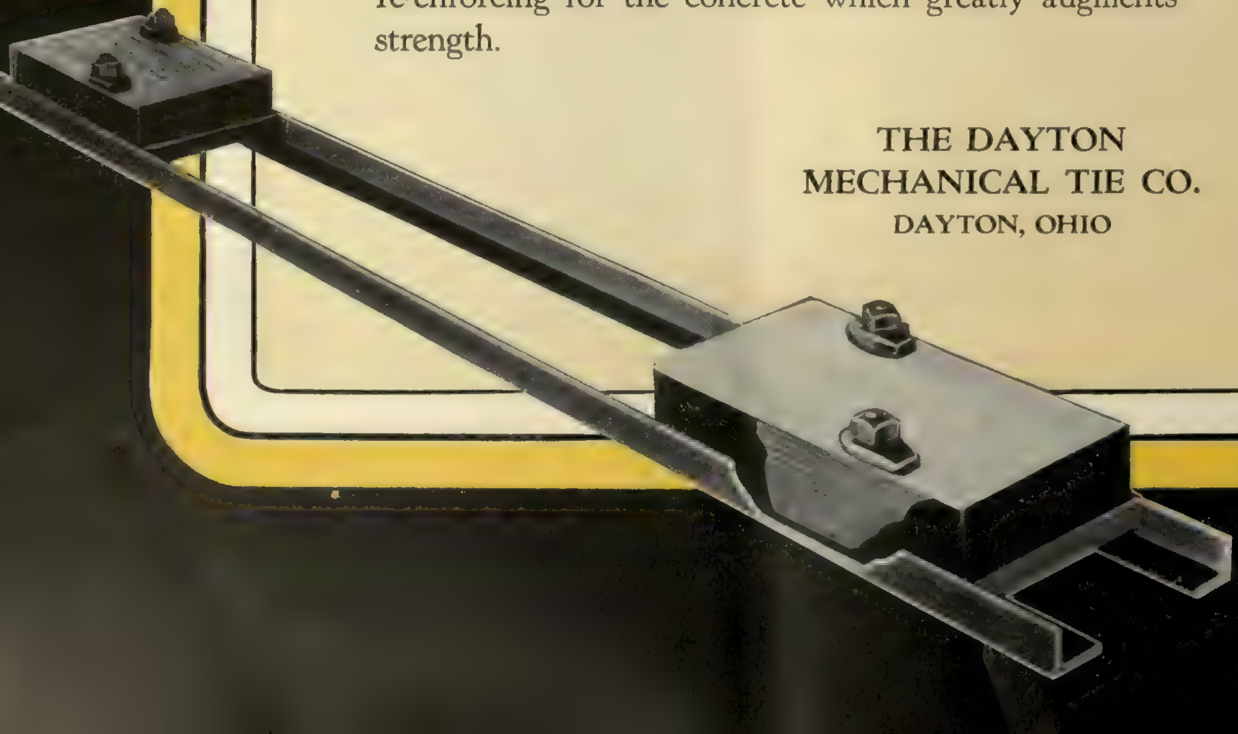
Long Life
No Major Maintenance
Low First Cost

The life of track built by the Dayton Integral System of Track and Paving Structure is so long that our 17 years in business has not established its limit.

But even better, it requires no major maintenance at all. It gives you good track that stays good with little or no expense.

Sometimes the life of inferior track may be prolonged, but only at a maintenance cost which in a relatively short time amounts to more than the original track cost. In such case it is more economical to lay new track—Dayton Integral Track.

Dayton Integral Track unifies track and paving foundation into a single, sturdy structure, provided with a vibration absorbing element which protects the concrete against destruction. The Dayton Tie also provides re-enforcing for the concrete which greatly augments strength.



THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO

When Low Cost Air Power Was Needed

to Pierce the Granite Backbone of the Cascades

Leaders of industry again chose Balanced Angle Compressors

Eighteen hundred men and a half-million in equipment, worked at once in America's longest railway tunnel.

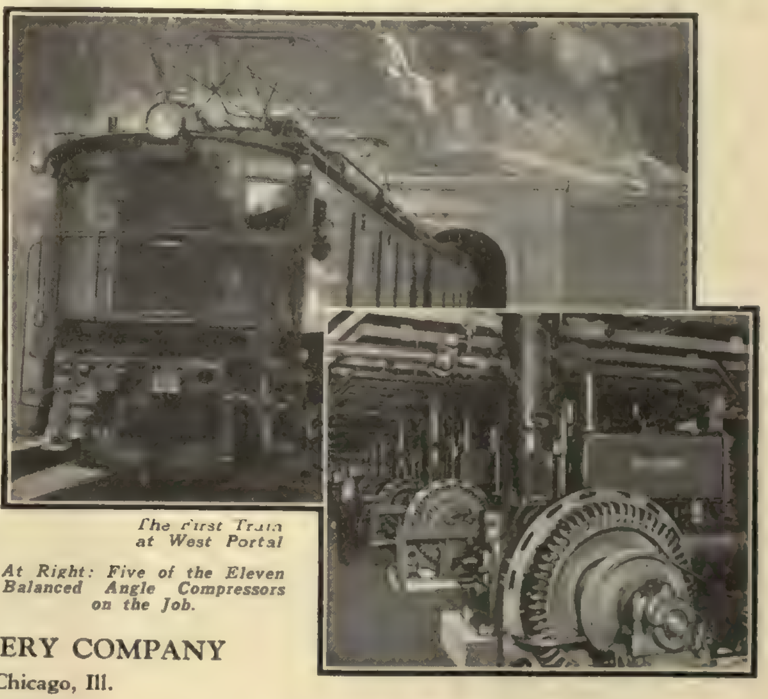
Drilling, blasting, and mucking were continuous. Three times world tunneling records were broken.

And vast effort—smoothly dovetailed—delivered the finished tunnel to the Great Northern three days before schedule.

Men and machines for this enviable organization were chosen carefully. One cent saved per ton of rock removed, meant $30,000.00 on the 7.78-mile bore.

So—like leaders in every industry—the contractors, A. Guthrie and Company used Air Power by Balanced Angle Compressors.

Sullivan Compressor Capacities, 68 to 5100 cu. ft. Catalog 83-J.



The First Train at West Portal

At Right: Five of the Eleven Balanced Angle Compressors on the Job.

SULLIVAN MACHINERY COMPANY
809 Wrigley Bldg., Chicago, Ill.

BALANCED SULLIVAN ANGLE COMPOUND

SULLIVAN TRADE MARK

A TROLLEY WHEEL

—seems to be a simple thing

BUT it isn't. It has to race along the wire, rain or shine, sparking when ice collects, pounding against trolley ears, and keep running smoothly all the time.

KALAMAZOO

trolley wheels and harps are built by experts — experts who devote their time and energies to no other task. Kalamazoo trolley wheels are the result of over a quarter of a century of study. Is it little wonder that they have received the respect of the industry—that they are standard equipment wherever the best is recognized?

May we send you bulletins and complete information?

The Star Brass Works
KALAMAZOO, MICHIGAN

More Wear-Life!

MORE wear, more life,—that's what you get when you use Boyerized parts. It's the special heat treating process that gives them greater wear resisting qualities. It's the careful design and special steel used in their manufacture that gives them longer life.

Look over the adjacent list and check off the items that are causing you the most trouble. Then replace them with Boyerized Parts, and see the difference for yourself.

BOYERIZED
PARTS

- Brake Pins
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- Brake Levers
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- Brake Bushings
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the equipment or machinery that you are not using. This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards.

Sell it

before depreciation scraps it.

The Searchlight Section is helping others—Let it help you also

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Wheels
with
Chilled Rims
and
Chilled Flanges

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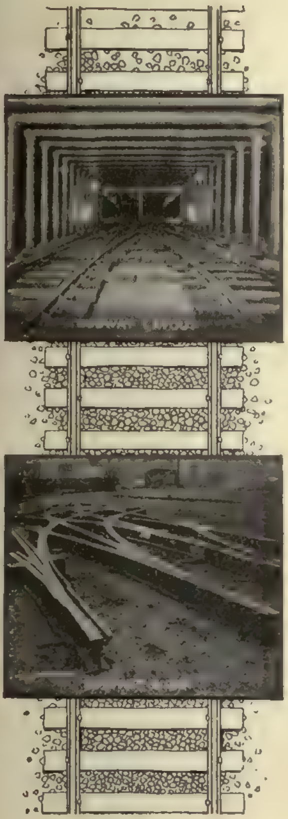

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Tisco
Special Trackwork

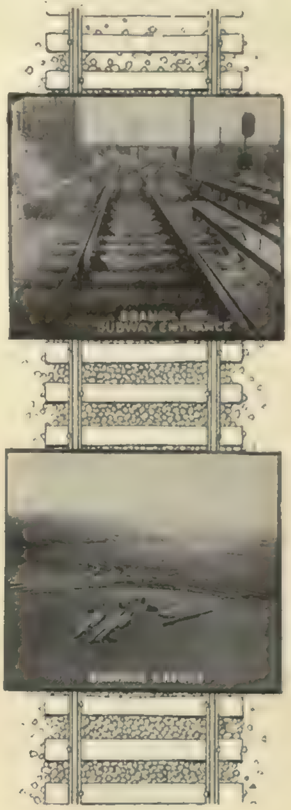
Whether it is a complicated layout for Subway or Surface Lines, or only a single piece, Wharton Tisco Manganese Steel Special Trackwork is built to withstand the severest service.

By keeping abreast of the constantly increasing demands of the time, Wharton Trackwork has successfully withstood the severest tests of service for almost 70 years.

We furnish trackwork of Chrome Nickel Construction, when this type of work is desired.

Consult us on your trackwork problems.

WM. WHARTON JR. & CO., INC.
EASTON, PA.



The Right Retriever

There is a special type of EARLL Trolley Catcher or Retriever for every type of service. Our business is making Retrievers and Catchers—nothing else. We have specialized in this particular field for your benefit. Consult us.

C. I. EARLL - - York, Pa.

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In harmony with modern car interiors

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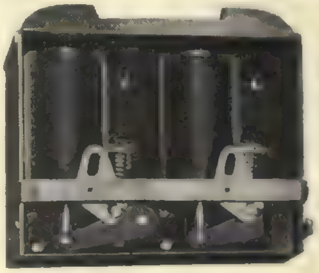
Beauty and simplicity are first considerations in designing modern car interiors. International Electric Fare Registers fit admirably into such interiors, because of their trim appearance and because they eliminate exposed mechanical equipment. All wiring between register and floor switch is readily concealed without sacrificing accessibility.

Electrical operation also eliminates wearing parts, oiling, noisy rods, and maintenance.



B-12 Electric Back

International Registers safeguard earnings and afford efficient service at all times. They are widely used in single and double types, for hand, foot, and electric operation.

Let us send you full details. Write today.

THE INTERNATIONAL REGISTER CO.
15 South Throop St. Chicago

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MAY 15th

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Electric Railway Journal.

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Consulting Engineers

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111 W. WASHINGTON ST., CHICAGO

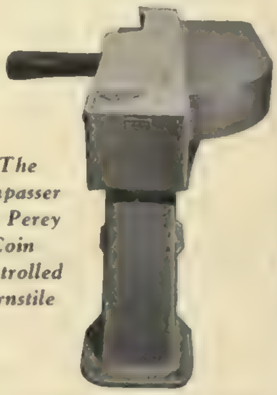
The Merry Crack of Ball and Bat

—is heard again throughout the land. And Electric Railway Companies are up against the old problem of getting the crowds away quickly and safely.

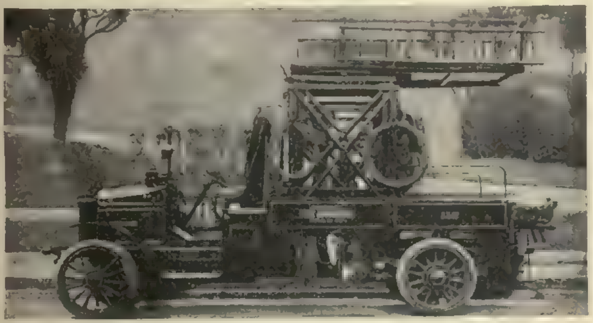
The Perey method of fare collection is the best solution. It not only enables you to handle more passengers in a given time, but quickly pays for itself by eliminating extra inspectors, non-paying passengers, and pilfering. Already used successfully in many cities.

Write for literature showing how the establishment of pre-payment and post-payment areas at your principle loading and unloading points; and the installation of Perey Coinpassers or Passimeters, will do away with delays, congestion and loss of revenue.

PEREY TURNSTILES
101 Park Ave., New York City



The Coinpasser —A Perey Coin Controlled Turnstile



TRUCK WITH TOWER IN RUNNING POSITION

TRENTON TOWER

This 3-Section

is not only more convenient, but stronger than the older type.

The top section is reinforced by the intermediate section. The 3-section design makes it possible to raise the platform 16 inches higher and drop it 12 inches lower than can be done with the old-style 2-section tower.

We'll gladly send you details.

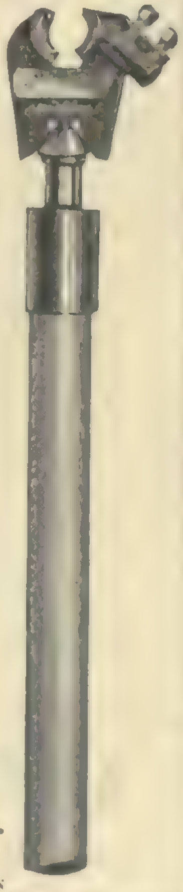
J. R. McCARDELL CO.
Trenton, New Jersey, U. S. A.

How you can use these "Grounding" Clamps

These are called grounding clamps, but you can use them on the wire for welding, grinders and other track work.

They are attached or loosened in a moment—a turn of the stick does the trick. Cat. No. 1020 will grip wire as small as No. 6 B&S up to and including 4/0.

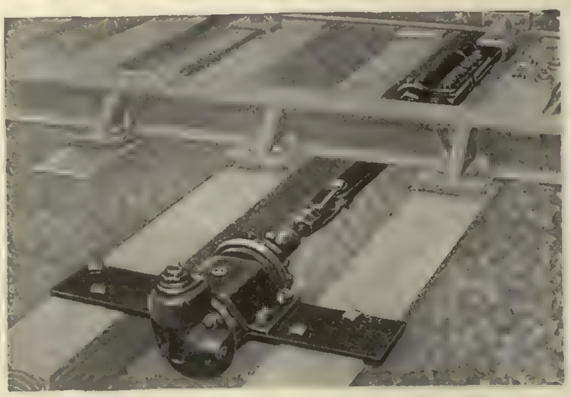
These clamps can be used for many other purposes, where quick positive temporary connections are required.



Send for further information and prices.

Albert & J. M. Anderson Mfg. Co.
289-305 A St., Boston, Mass.
NEW YORK CHICAGO PHILADELPHIA LONDON

RACOR
TRADE MARK



QUICK TO OPEN - SLOW TO CLOSE

The Racor Oil Cylinder Retarding Dash Pot

acts on the principle of a door check. Used where switches are normally trailed through, it eases the return of the points and thus saves wear on the inside of the points. The action is definite and it will work under all climatic conditions. Particularly adapted for use with Ramapo Automatic Return Switch Stands.

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RACOR PACIFIC FROG & SWITCH CO. Los Angeles — Seattle

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Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

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Industrial Cleaning Materials and Methods

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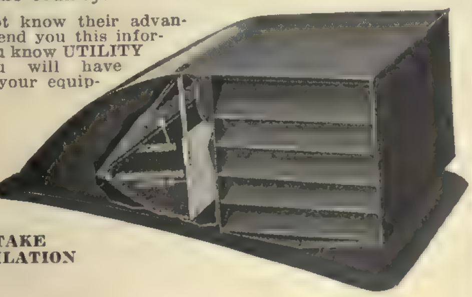

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Makes strong welds and is used where only the highest quality of welding wire is acceptable.

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A design which *inherently* provides increased insulation so that one can safely buy on *rated* values.

Very novel design of conductors resulting in low temperature rise.

The electro-magnetic stresses of high inrush current are employed to increase contact pressure.

All important mechanical working parts are fully enclosed and automatically lubricated.

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Just off the press.

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Electrical Measuring and Protective Apparatus

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ROLLER SMITH

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Offices in principal cities in U. S. A. and Canada.
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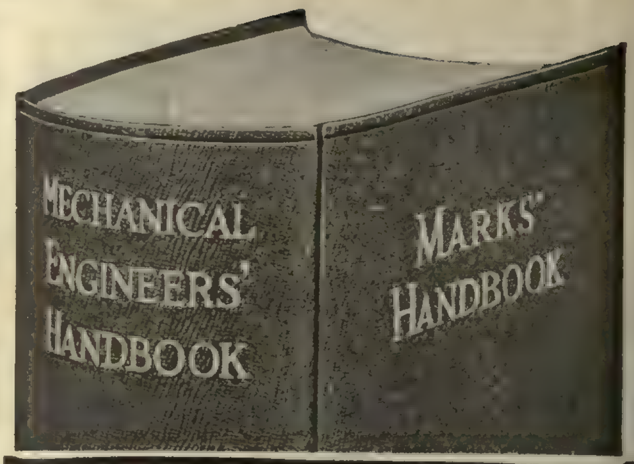

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VHEN DO POLES BREAK

Studies in Pole Line Design

Number two of a series of six. This is the second of six advertisements on pole line design. The first discussed pole strength and its relation to economy. This one presents "maintained strength." The remainder of the series will cover other factors of importance to engineers and pole users. It is suggested that the series be preserved for future reference.

AMERICAN CREOSOTING COMPANY
LOUISVILLE, KENTUCKY

Is the Age-Strength Curve

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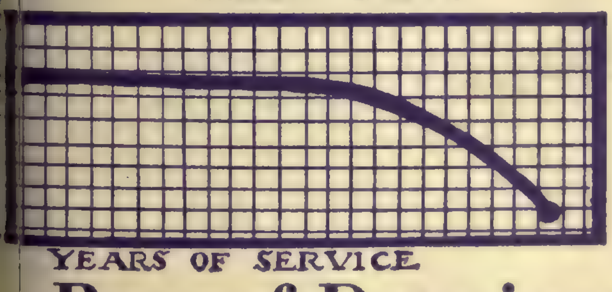

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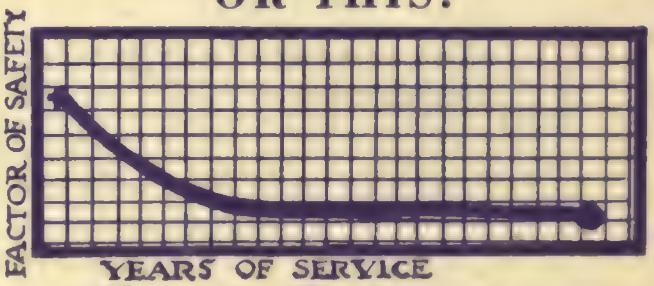

Rate of Deterioration in Wood Poles is a Vital Factor in Pole Line Economics

When Do Poles Break?

The simple analysis in the first study of this series showed that a pole breaks when its moment of resistance is less than the combined moments of bending or, in other words, when its factor of safety is less than one. Assuming no change in loading, the maximum bending moment is fixed throughout the life of the pole. If the new pole was properly selected, its moment of resistance exceeded this maximum bending moment by a safe margin. Failure will only occur, therefore, when the moment of resistance has decreased to less than the bending moment—or, in other words, when the strength of the pole has deteriorated.

Why Do Poles Lose Strength?

Like all other structural materials, wood poles are subject to deteriorating influences as time goes on. Decay is usually the agency which eventually reduces the strength of wood poles to the point of failure. Decay is a breaking down of the cell structure caused by fungus growth. This growth is slow or rapid, depending on various factors such as the character of the wood, presence of moisture, contact with the earth and the protective measures adopted.

How to Control Rate of Deterioration

Of the factors which effect deterioration in poles, the climatic and soil conditions are fixed by the location of the line. The only way to control this deterioration, therefore, is either to select wood which does not decay readily or to use protective means to insure the same result. Wood naturally resistant to decay is practically out of the market for pole use. The only choice, therefore, is between a rapidly decaying untreated pole or one that is protected by impregnation so that decay does not affect it appreciably for long periods.

Effect of Treatment on Pole Strength

As pointed out in the previous study, southern yellow pine is the strongest species of wood available for poles. Its structure is also more adaptable for preservative treatment than any other wood used for structural purposes. This treatment does not impair the natural strength of pine as demonstrated in tests conducted by the Forest Products Laboratory, the Engineering Experiment Station at the University of Illinois and the Atchison, Topeka and Santa Fe Railway. The strength of treated poles is usually more uniform than that of untreated.

Effect of Deterioration Rate on Factor of Safety

In selecting poles to give maximum economy, it is necessary to use a factor of safety large enough to insure against untimely failure but not so large as to add excessive cost to the line. Engineers are coming to realize that comparable estimates of untreated and treated poles can only be made when a factor of safety is selected to correspond with the rate of deterioration of each pole. The pole that loses strength rapidly should have a higher factor of safety at the beginning than one which maintains its strength for a long period. It is not enough to assume a longer life for the untreated pole. Adequate treatment not only insures a greater total length of service, but also provides a higher factor of safety against failure throughout the entire life of the pole. For comparable results, therefore, an untreated pole must have a higher factor of safety when new than a treated one. This obviously means the use of larger untreated poles than the strength when new would indicate and gives treated poles a still further advantage in a careful economic study.

Do Treated Poles Maintain Their Strength?

The above discussion assumes that preservative treatment results in maintaining the original strength of a pole throughout its life. The engineer or pole user who has not had opportunity to test this fact in his own experience is obliged to depend on the evidence available from other users and from impartial agencies which have conducted tests on poles after many years of service. There is ample evidence that creosoted southern yellow pine poles 20, 30 and even 40 years old do have practically the same strength as new. Typical among such tests are the following:

Ten Creosoted Southern Yellow Pine Timbers, after service of 29 years, tested at Tulane University in 1912 showed the modulus of rupture varying from 3350 to 7890 lbs. per square inch. Similar tests on timbers 34 years old at Lehigh University showed a range in the modulus of rupture from 4300 to 6700 lbs. per square inch. Engineers who have studied these and numerous other similar tests are convinced that as long as the creosoting is effective in preventing decay, the strength of the pole is practically constant.

For additional copies of this series of studies of pole line design or for quotations and information on AMCRECO Creosoted Southern Yellow Pine Poles, address the nearest sales office.

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The CLEVELAND meets all modern fare collection conditions.

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No Gases No Fumes

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N-L Heaters do not have a harmful effect on the motor, using only heat otherwise wasted.

Adoption of N-L Heaters as standard equipment by prominent manufacturers speaks well for their efficiency. Write for detailed information.

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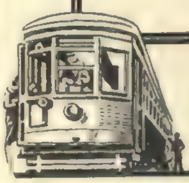
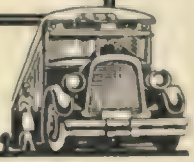


Samples and full information gladly furnished.



The PANTASOTE COMPANY, Inc.
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R.J.

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WANTED master mechanic, Western short line interurban A.C. operation; state complete experience and salary expected. Address P-175, Electric Railway Journal, 883 Mission St., San Francisco, Calif.

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EQUIPMENT superintendent, seven years' experience as superintendent of equipment with large operating company; seeking similar position with operating company or connection with railway supply company. Thoroughly familiar with street railway problems both from engineering and operating standpoint. Member American Society of Mechanical Engineers. PW-171 Electrical Railway Journal, 7 So. Dearborn St., Chicago, Ill.

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LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Electric Railway Journal, published weekly at New York, N. Y., for April 1, 1929.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electric Railway Journal and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only).

McGRAW-HILL PUBLISHING COMPANY, INC.
C. H. THOMPSON, Secretary.

Sworn to and subscribed before me this 29th day of March, 1929.

[Seal.] H. E. BEIRNE.
Notary Public N. Y. Co. Clks No. 97, Reg. No. 1B84. Kings Co. Clks No. 646, Reg. No. 1089.
(My Commission expires March 30, 1931.)

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CARS

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7 So. Dearborn St., Chicago, Ill.

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ELECTRIC RAILWAYS AND EQUIPMENT

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The prices we will pay for these motors are good.

If you have any to sell, communicate with us at once.

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Priced At **$1000** And Up

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—may be interested in the Used Buses advertised.
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Make a point of checking these pages every month!

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ELECTRIC LOCOMOTIVES

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*"Our integrity
is
your guarantee."*

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All in Excellent Condition.
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5—12 v. Johnson Electric Fare Boxes Registering Dimes and Nickels, with Registers.

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2800—273/125 Sec. 9-in. **Rail Brace Tie Plates**
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Purchasing Department
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for Equipment-Opportunities

And now . . . even better pole service

To improve our service to pole customers, we have collected a standard surplus stock of 10,000 straight, sound Southern Yellow Pine poles in a variety of sizes and lengths.

We have your size, already air-seasoned . . . ready for framing and pressure creosote treatment to your specifications upon receipt of your order.

Your emergency requirements or your periodical purchases will be handled with a speed and precision you did not believe possible.

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

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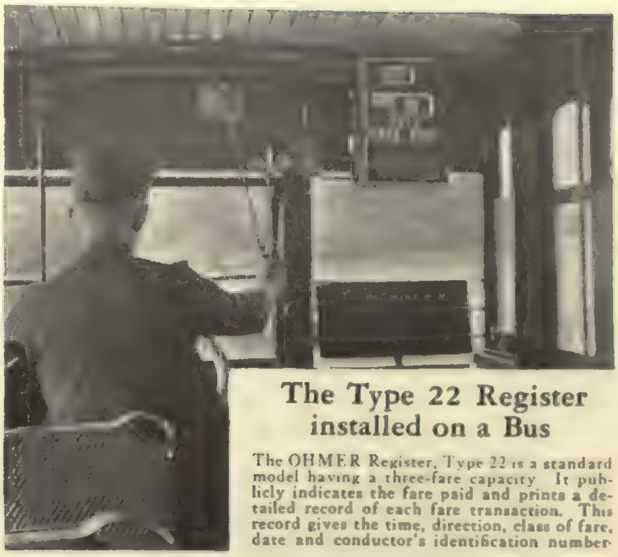

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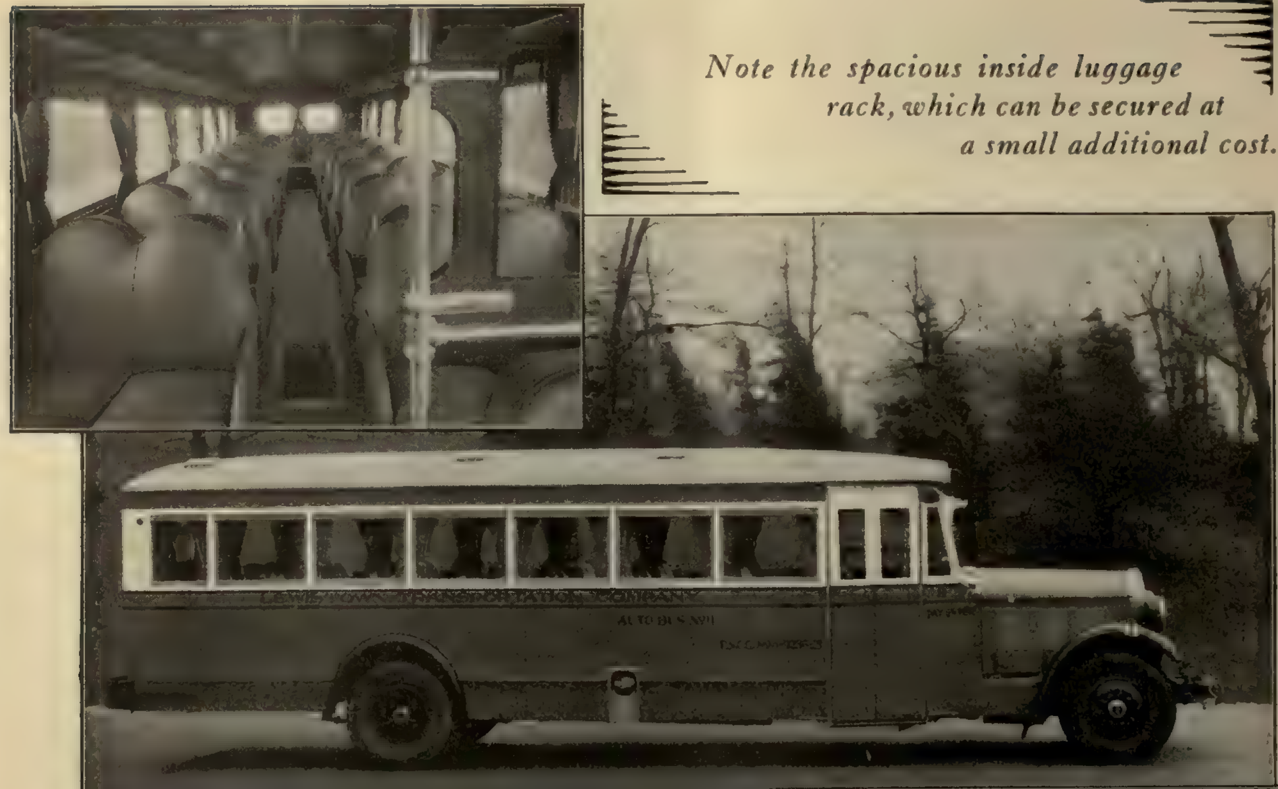

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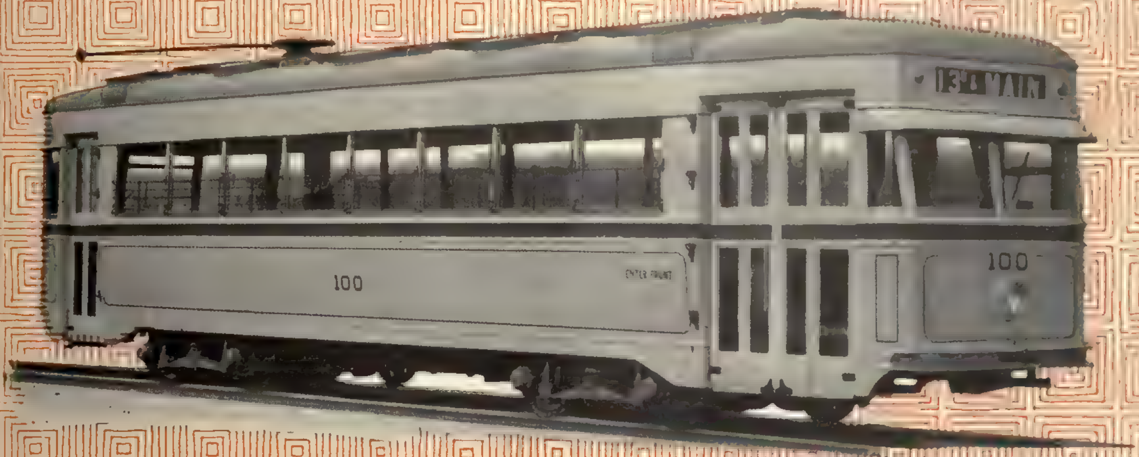

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